



FRIDAY, JANUARY 25.

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## Contributions.

## Mail Trains in Strikes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial of Jan. 11 concerning the relative importance of passenger trains and mail trains suggests an interesting question concerning the laws for the protection of the railroads and the public from evil disposed strikers. On the occasion of nearly every strike of railroad men we read of the "who'some fear" in which strikers refrain from interfering with the mail trains, while at the same time they have little hesitation in taking illegal steps of various sorts to block the passage of other trains. While admitting the justness of the general principle enunciated by Postmaster General Dickinson, there is yet a question whether the interests of the passengers on a train, while still kept subordinate to those of the thousands who have letters in the mail car, should not be protected more vigorously than they are. If the statutes are right as they now stand, why cannot the railroads arrange to carry a mail bag or two on every train and thus provide all passengers with the protection afforded by the talisman which so effectively keeps law-breakers at a distance? If the laws are not equally adjusted, why not change them? At first thought it seems somewhat unfair to punish a man by long imprisonment for delaying a letter, while if he completely stops passenger travel the attorneys will very likely wrangle over his case so long that he goes free. A law so just and effective that it prevents crime, thus removing the necessity for courts and officers to punish criminals, is certainly too good to be narrowly restricted to a single interest, the mails. It should be extended to all train service. To pull pins in a freight train may delay merchandise of as much importance as a \$1,000 draft in a letter. Moreover the detention of freight trains, often hinders mail trains, so that possibly the railroads might avail themselves of the present law for far greater protection than they now get. The whole subject should receive much more attention than is now given it.

R. C. A.

[Some comment on this letter will be found in the editorial column.—EDITOR RAILROAD GAZETTE.]

## State Railroad Commissioners' Authority over Mail Trains.

ALBANY, N. Y., Jan. 18, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A recent report of the Railroad Commissioners of this state illustrates a point in connection with the Postmaster General's recent decision, published in your paper. I will state the facts, and leave your readers to form their own opinion. It is hardly necessary for me to form a judgment for them.

Three ban V at ertown made a complaint to the Railroad Commissioners, asking that the Rome, Watertown & Ogdensburg be compelled to run a train at an earlier hour from Utica or Rome to Watertown, in order that the mail might reach Watertown earlier in the morning. The regular trains left Utica, Rome and Syracuse between 7:15 and 7:35 a. m. The train from Rome reached Watertown at 10:15 a. m. The southbound train carrying United States mail leaves Watertown at 7:15 p. m., thus giving nine hours for receiving and answering letters in that city.

The Commissioners, after hearing the complaint and hearing the answer of the road, ordered the company to change its time-table and run its trains out of Utica, Rome and Syracuse at about 5 a. m. The trains via Utica and Rome connected with the New York Central train leaving New York City at 11:30 p. m. The recommendation of the Board was that passengers leaving New York should take the 6:30 instead of the 11:30 p. m. train.

The company's remonstrance embodied the following points:

1. It would compel local passengers from Utica, Rome and Syracuse to get up and take the train at 5 a. m., instead of 7:30, thus injuring the local business, particularly in the summer season, when large numbers of passengers from these cities go to the various resorts.

2. The breaking of connection with the train leaving New

York City on the New York Central at 11:30 p. m. would bring about very great inconvenience and delay to passengers from New York City. A sleeper runs on that train through from New York City to Watertown, which carries an average of 7½ passengers daily. These passengers under the recommendation of the Board would take the sleeper at 6:30 p. m. (thus being several hours longer on the route), and would reach Utica about 3 o'clock in the morning. They would lie there in full hearing of passing trains until 5 o'clock and then go on to Watertown. Passengers in common cars would be obliged to take the 5:30 p. m. train out of New York, get up at Utica or Rome at about 3 o'clock in the morning and wait there in the station from 2 to 2½ hours.

3. The train leaving New York City at 11:30 p. m. affords the R. W. & O. a connection by which it obtains its passengers from points south and east of New York, and also its passengers from Boston and points in New England. No other trains make these connections. The breaking of this connection would therefore deprive the road of a large amount of competitive passenger traffic, not to mention the inconvenience to passengers from those points to our local stations. This competitive traffic is to points in Northern New York reached by other lines, tourists' resorts on the St. Lawrence River and points in Canada.

The recommendation would also injure the competitive traffic from the West and break the connection with the D., L. & W. at Syracuse and N. Y., O. & W. at Central Square and Oswego, thus sending traffic to the summer resorts by boat from Oswego. The affidavit of the company showed that \$15,000 per year would not cover the loss on this competitive passenger traffic.

\* \* 5. Three-fourths of the mail for points on this road is carried by the fast mail train leaving New York at 9 p. m., reaching Utica at 4:15 a. m. The delay of this mail at Utica and Rome until a little after 7 a. m. was the delay complained of. The remaining 25 per cent. of the mail arrives about 7 a. m., and under the recommendation would be left at Utica and Rome until about 1 p. m. The mail from the West would suffer the same delay from a little after 6 a. m. until 1 p. m. There were other considerations which I will not stop to enumerate.

The company very properly declined to follow the recommendations of the Board and the Commissioners have referred the matter to the Attorney-General of the state for action.

Decisions of this kind make one thankful that our railroad commission has only recommendatory powers.

The merits of the case are patent. But, assuming that the position of the banks deserved consideration, and that they needed relief, why should they go to the railroad commission? The Post-office Department of the United States Government, whatever its shortcomings elsewhere, certainly is always alive to the demands of the public as regards frequency of mail trains, and there is no doubt that the government officials would do anything within the bounds of reason to accommodate the public. A "fast mail," with white cars and a strong locomotive, is the only thing that would satisfy these complainants in the letter-carrying line; and if they got their wishes here, they would then expect the earth to be inclosed with a gold fence and a first mortgage upon it at once executed in their favor. What right, any way, has the Board of Railroad Commissioners to entertain jurisdiction in a matter whose control the general government has reserved to itself?

J. M. E.

## Standards in Car Construction.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We have all read or heard about the Deacon's one-hoss shay, which was built in such a logical way and made of such suitable material, and planned out so well, that one part was as strong as the other and each of just sufficient strength for its work. If the spirit of its builder animated the minds of those in charge of car construction there would be better proportion of parts, less changing and altering after cars are built and more economy in repairs and renewals.

The details of freight cars are not always strengthened in proportion to the increase of capacity, and the wish to keep certain parts standard and common to as many classes of cars as possible, very often is accorded more weight in the minds of the designers than the proper harmony of the whole structure. How often cars are seen of 40,000 or 50,000 lbs capacity, with draw gear or trucks, etc., originally designed for one-half the load, breaking down under the too great strains put upon them. How many railroads find after building several hundred, or perhaps thousands, of a new class of cars, whose capacity has been increased over those previously built, that certain parts break offener than they should, that the repairs on other parts are too heavy and the proper mileage and service is not obtained from them, until finally an effort is made to correct these evils, and to strengthen the weak points by substituting pieces of greater strength? In order to make these renewals uniform and keep all the class alike orders are issued to apply them to all cars of the same kind when renewals are necessary, either by breaking down, wearing out, or when cars are wrecked, instead of repairing with parts similar to those as originally built. Before this work is half accomplished, economies may be necessary and the force of car repairers reduced to such an extent that only work absolutely essential to keep the cars on the road can be done. So it continues from year to year, work half accomplished, half done, part of them remodelled, part same as built, and the chances are the commendable intention of altering the whole class and making all uniform is finally lost sight of. Perhaps new officers are elected or new foremen appointed, who see different, and to them better, ways

of renewal than their predecessors, and as the tendency in men is often to see more merit in what they originate or do themselves, the work is done in a very different manner to that originally planned out.

The extra cost to railroads from large numbers of cars improperly designed for their service can hardly be estimated. Judging from the diversity of sizes and shapes of the different parts which make up a complete car, there is much room for argument as to what would constitute a properly designed car. Perhaps it is several years too soon to propose a standard car, but it would certainly appear that there is no good reason except the superabundant inventive talent of the American people, and the desire not to copy exactly, for the very different ideas which exist regarding the strength and duty of various parts which constitute a complete freight car. Any person who has had much to do with the repairing or handling of supplies to repair the thousand and one styles of "foreign" cars can bring to mind the almost incredible number of different patterns required to keep up the repairs on interchange cars. Patterns of like parts of different roads almost identical, except perhaps some one or two dimensions, which render them non-interchangeable, and requiring parts, peculiar to every class and style of car which are run in large numbers over any road, to be kept in stock ready for prompt repairs to avoid long detentions.

In building freight cars the aim should be to properly proportion them in all details for the service for which they are intended, to use suitable material of good quality, to make them strong, durable and easy of repair, to lessen the dead weight of such parts as can be made of malleable iron instead of cast iron, such as draw-heads, etc., or pressed steel for box lids, stake pockets, etc.; in short, to substitute lighter and stronger material for the clumsy and heavy cast-iron parts so much used heretofore. It is only by using the utmost care in designing, by close observation of previous failures, by long experience in this class of work, by laying aside prejudice and giving the preference to such features as have stood the test of time and hard service, rather than to original and sweeping innovations and novelties, that the best results can be attained and more systematic construction become general.

The standards of the M. C. B. Association have done much to "boil down" a few leading parts—notably the axle, journal bearing and key. No one can question the fact that a long step forward in the right direction was taken when these standards were adopted. And although there was much criticism about their design and proportions, yet they have slowly but surely come into general use.

Within the last year or so the size and capacity of many cars appear to have outgrown the M. C. B. axle, and various ways of enlarging, either by simply increasing the diameter to 4 in. or by keeping the same length over all, and turning back the journal to 7½ in. long, making it 4 in. by 7½ in., or by still further enlarging it to 4½ in. by 7½ in., with the other dimensions the same, are seen on cars belonging to various roads. Many railroads are making axles with journals 4 in. by 8 in. of various lengths and centres, and already much diversity exists. The weight and capacity of cars has increased to such an immense extent in the last few years that it seems safe to assume they will in the years to come grow to still greater proportions, and it would appear good policy in adopting standards to make them rather over than under size, and not cut down to the last ounce, but to design somewhat for the future as well as the present.

C.

## Re-heated Exhaust Steam.

NEW YORK, Jan. 17, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have occasionally seen articles in your paper which set forth the advantages and economical results obtained from utilizing exhaust steam for heating purposes. I would respectfully remind you that there is a system in use which deserves mention in discussions of the subject.

From a perusal of the articles referred to, one might infer that the maximum of economy was reached where exhaust steam was used in its normal condition as it comes from the cylinder. Such, however, is not the case. If it is possible to raise the temperature of exhaust steam from 212 degrees Fahr. to 350 degrees Fahr., and if at the same time it is possible to increase the volume of the steam as well as to re-evaporate the moisture carried along in the steam, and to do all this by utilizing the waste gases of combustion from boiler furnaces, thus at no expense of fuel, it is clear that a still greater gain can be made by thus re-heating the exhaust steam before using it for heating, boiling, or drying purposes. The fact that this has been fully and repeatedly demonstrated warrants me in calling your attention to the matter.

It is well understood that large economical results have been shown where the use of live steam has been superseded by the use of the re-heated exhaust steam; but it is also true that results nearly as favorable have been secured by substituting the re-heated exhaust steam in place of exhaust steam in its normal condition.

S. D. BREWER.

## Interlocking in Yards.

HILLBURN, N. Y., Jan. 17, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the notice of our new catalogue in your issue of Jan. 11 I read the following:

"The elegance of the buildings and neatness of other surroundings indicate enterprise, but the presence in main tracks of from a dozen to twenty common switch stands huddled as closely together as they will stand tends to destroy the good impression." We beg to inclose one of our stand circulars, issued long before this catalogue. All the stands



No. 66b.  
60-lb. Steel. Laid September, 1884; removed  
July 15, 1887.  
Carbon, 0.21. Phosphorus, 0.113.  
Manganese, 0.44. Sulphur, 0.025.  
Silicon, 0.025.  
Tensile strength, 88,600 lbs. per square inch.  
Elongation, 23 per cent. in 5 in.



No. 121.  
60-lb. Steel. Laid October, 1878; removed  
July, 1887.  
Carbon, 0.42. Silicon, 0.082.  
Manganese, 0.92. Phosphorus, 0.129.  
Tensile strength, 88,000 lbs. per square inch.  
Elongation, 7 per cent. in 5 in.



No. 123.  
60-lb. Steel. Laid October, 1876; removed  
June, 1887.  
Carbon, 0.48. Silicon, 0.065.  
Manganese, 0.99. Phosphorus, 0.146.  
Tensile strength, 80,400 lbs. per square inch.  
Elongation, 2 per cent. in 5 in.



No. 124.  
60-lb. Steel. Laid October, 1876; removed June, 1887.  
Carbon, 0.35. Silicon, 0.119.  
Manganese, 0.84. Phosphorus, 0.140.  
Tensile strength, 97,700 lbs. per square inch.  
Elongation, 17 per cent. in 5 in.



No. 161.  
Caused Wreck at Rosemount.  
Carbon, 0.79. Silicon, 0.070.  
Manganese, 1.02. Phosphorus, 0.149.

FROM PHOTOGRAPHS OF ETCHED RAIL  
SECTIONS—CHICAGO, MILWAUKEE  
& ST. PAUL RAILWAY.

NOTE.—Nos. 123, 124 and 125 were laid on a 26-ft. grade, and were the oldest and best steel on the River Division, and the best when taken out.

No. 121 was on a level.

metre wear to 16,800,000 tons, and that a rail can be worn down 10 millimetres. Lanino calculates the life of a rail at 150,000,000 tons, and Funk at 125,000,000. Many rails go into the scrap heap with only  $\frac{1}{8}$  in. abraded, and while this is partly due to poor material, in a larger sense it is due to faulty design.

It would be equally interesting to arrive at the tonnage life of wheels. Unfortunately there is not much data for the determination of the life of the ordinary cast-iron wheel in tons carried. Mr. William Stroudly, of the London, Brighton & Southwestern of England, determined that the tires of locomotive drivers 76 in. diameter, carrying a weight of 83 net tons, wear down  $\frac{1}{8}$  in. for 28,000 miles of travel; equivalent to 60,800,000 tons per  $\frac{1}{8}$  in., or 19,000,000 tons per millimetre. The accompanying table compiled by Mr. J. N. Barr, Superintendent of Motive Power, Chicago, Milwaukee & St. Paul, shows that a tonnage of 41,000,000 causes a wear of  $\frac{1}{8}$  in. in the tread of the tire. This is from the result obtained with 40 locomotives, making an aggregate of over 16,000,000 miles.

From data furnished by Mr. G. W. Rhodes, Superintendent of Motive Power, Chicago, Burlington & Quincy, we find an approximate average of 31,380,000 tons per  $\frac{1}{8}$  in. wear of tire for 3-in. tire, and 20,674,000 for 4-in. tires. As drivers are turned in sets, to suit the greatest wear on any one spot of the most worn wheel, this exhibit does not even approximately indicate the loss of metal due to abrasion.

The author next shows the tonnage service of steel-tired 33-in. car wheels under passenger cars, where the unknown element of wear is that due to the brake shoes and to sliding. For the information on which this estimate is based he is also indebted to Mr. Barr. Coach No. 235, weighing loaded 66,000 lbs., with a load per 33-in. wheel of 5,500 lbs., ran 95,110 miles. The average loss was 0.762 in. in the circumference of the wheel. The following formula will give closely the tonnage service for each  $\frac{1}{8}$ -in. tread of 33-in. wheel worn down:

$$\frac{6 \times \text{weight on wheel in pounds} \times \text{miles run}}{25 \times \text{circumference wear in inches}} = \text{Tons of service for } \frac{1}{8}\text{-in. direct wear in thickness of tire.}$$

In the case above cited the tonnage service for  $\frac{1}{8}$  in. wear was 164,757,428.

WEAR OF DRIVING WHEEL TIRE, C. M. & ST. P. RY.

Class of Engine.	Average diameter of tires.	Number of driving wheels.	Total weight on drivers in lbs.	Number of sets.	Number of runs.	Total wear in 32ds of an inch.	Total miles run.	Average miles run to $\frac{1}{8}$ in. tire wear.	Tons service to each $\frac{1}{8}$ in. of tire wear.	Total tons service for each tire in million tons.	Tons service for one millimetre of tire wear.
<i>Freight:</i>											
17 in. Rhode Island.....	62 in.	4	55,450	5	12	193	995,555	20,633	46,512,591	449	
17 in. ".....	62 in.	4	55,450	5	17	235	620,040	16,165	36,435,149	315	
17 in. ".....	62 in.	4	55,450	5	17	235	893,320	15,205	34,276,470	403	
<i>Passenger:</i>											
18 in. Rhode Island.....	62 in.	4	58,500	5	19	201	978,506	19,473	46,303,785	465	
18 in. ".....	62 in.	4	58,500	5	14	159	744,453	18,728	44,533,699	354	
Ten-wheel freight.....	62 in.	6	81,000	10	23	334	1,458,332	17,465	38,348,471	320	
Standard 18 in. passenger.....	68 in.	4	64,400	5	5	49	373,319	30,475	72,758,595	178	
Average excluding last....									41,042,414	384	12,935,769

referred to in these two views are not, as you express it, common switch stands, but the automatic switch stand, as indicated in the cuts, and explained, we think, fully by the reading. The principal feature of these switch stands is that it is impossible for a train to leave the track if the switch is set wrong. These switch stands have been widely introduced, and we have furnished within the last four years in the neighborhood of 15,000 of them.

RAMAPO IRON WORKS,  
FRED W. SNOW, Supt.

[If 15,000 have been sold in four years, is that not reason enough for calling these stands "common"? The last two words in the sentence immediately preceding the one quoted by Mr. Snow ought to have been enough to prevent his misunderstanding of our meaning. We made no objection to the form of stand in use, but to the absence, in a complicated yard of a rich company, of all interlocking. However efficient may be the automatic stand in providing against derailments, it does not prevent false or conflicting movements of trains.—EDITOR RAILROAD GAZETTE.]

Cylindrical Wheels and Flat-Topped Rails.\*

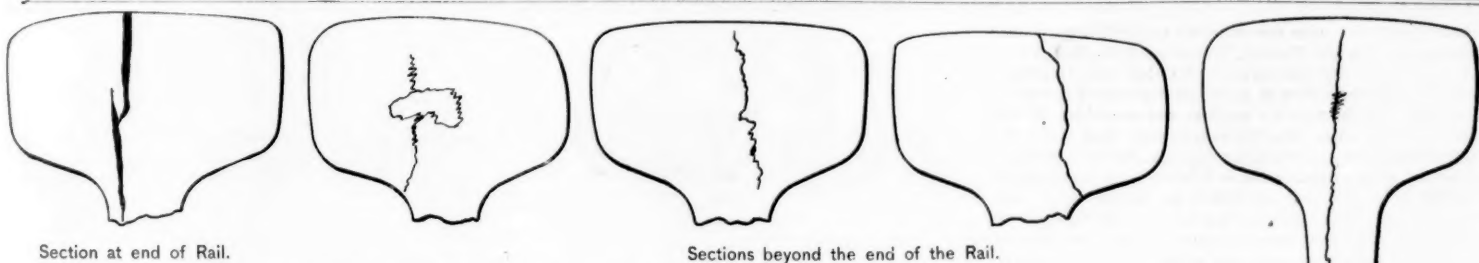
"Fool," said my muse to me, "look into thy heart and write."  
—Sir Philip Sydney.

The scrap heap, that inarticulate witness of our blunders and the sepulchre of our blasted hopes, the best but most humiliating legacy we are forced to leave to our successors, has always to me been brimful of instruction.—The Author.

The words which preface Mr. Whittemore's paper are extremely characteristic. They suggest the fancy and humor, and the picturesque phrases with which he has embellished his subject; and they suggest, too, the serious conviction

\* Abstract of a paper read by Mr. D. J. Whittemore, Chief Engineer Chicago, Milwaukee & St. Paul Railway, at the annual meeting of the American Society of Civil Engineers, Jan. 16, 1889.

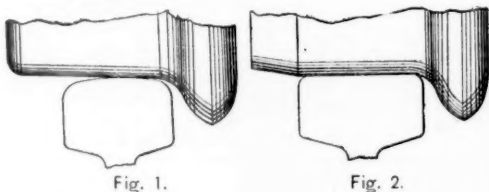




DIAGRAMS OF BROKEN RAILS FROM THE CHICAGO, MILWAUKEE &amp; ST. PAUL RAILWAY.

By the use of this formula, applied to data obtained from the service of 33-in. Allen steel-tired car wheels in the passenger service of the C., M. & St. P., Mr. Whittemore ascertains the tonnage service per  $\frac{1}{8}$  in. wear as 149,132,710. This is deduced from observations on 23 different cars, and the tonnage service varies in these 23 cars from about 102,000,000 to upward of 253,000,000. From observations on 42-in. steel-tired Allen wheels Mr. Whittemore obtains an average of 177,544,268 tons per  $\frac{1}{8}$ -in. wear. Making allowance for wear due to brake shoe and the flow of metal, the tonnage service for abrasion due to rail contact will be largely increased. In fact, there are so many varying and conflicting conditions, so much data wanting, such as loss by corrosion, etc., that it seems about as impossible to determine a fair expression for abrasion due to rolling loads alone as to have the Missouri River act according to mathematical formula. But it is submitted that the facts presented indicate that failure does not result so much from abrasion as from some other cause.

The means proposed by Mr. Whittemore for increasing the life of wheels and rails is the use of cylindrical wheels on a flat-topped rail, and the section of rail proposed by the author is shown in fig. 2, although he does not indorse that section in its entirety.



When the subject of rails was under discussion at the last annual convention, Past President J. B. Francis gave the key to the solution of the problem in the statement that materials composing wheels and rails should not be submitted to pressure beyond their elastic limit. Over a dozen years ago, in an evening's discussion with Mr. C. Shaler Smith, on the subject of elasticity, the author arrived at the conclusion that driving-wheels of locomotives, as then loaded, must have a diameter of about 17 ft. to keep the contact between wheel and rail within the elastic limit.

As children we listened with interest to the story of the genius shown in the invention of coned wheels, and were taught that without it curves could not be operated. What are the facts? A new wheel, constructed in accordance with the rules of the M. C. B. associations is coned to suit a curve of about 5,000 ft. radius and no other, and after six months' use this wheel is worn either hollow at the flange or from the flange, so much so, that in at least one-third of the instances in passing curves the inner wheel travels on its greatest diameter, and quite often the outer wheel travels on its least diameter.

The form of rail shown in fig. 1 is that lately recommended by Sandberg for 100-lb. rails, and has a top radius of 6 in., and it is about the best arrangement that can be devised to concentrate the stress on a point and have the travel of the wheel on a line. These are conditions that are revolting in a mechanical sense, conditions which we would not attempt to reproduce in almost any other mechanical device. The work of wheels constantly tends to drive down this arch of the rail, as a wedge, and by flow of metal to make it flatter, facts resulting in shattering and piping the rail heads, with but little loss of material from direct wear.

Mr. Octave Chanute, many years ago, gave us the result of his measurements of the area of contact between wheels and rails, and the writer quite recently made measurements in a similar manner, the result of which it may be proper to reproduce here. The first test was with an engine having 4 drivers, each carrying 16,000 lbs., diameter of wheels 70 in., tires much worn, on a steel rail 5 years in constant service. A composite picture of the apparent areas of contact showed an egg-shaped oval, having a major axis across the rail of 1.48 in. and a minor axis along the rail of 1 in., inclosing an area of 1.7 sq. in. The second test, with an engine having 6 driving wheels, 64 in. diameter, 13,800 lbs. per wheel, tires in service 6 months, gave a similar figure of contact, with a major axis of 1.27 in. and minor axis of 0.79 in., and an area of 0.86 sq. in. Through such contact is transmitted the power exerted by locomotives, not only in their direct compressive force, but also in their pulling capacity of, say, 40,000 lbs. on the laminae of the rail. It is on this spot where, if the statement in the paper now before the Society is construed literally, occurs that miraculous chemical action, "the molecular interlocking of the fibres" of a non-fibrous substance. But I suppose we all know the meaning intended by this sentence.

To me, and doubtless to many of our members outside of some of your committee, the solution of this problem rests in having a flat and sufficiently broad surface to the rail, to

support cylindrical wheels, to meet the pressures within the elastic limits of the metal.

And here we are met by the statement in a paper now before us that it is not clear that "increased bearing surface is in itself an advantage," and when we attempt anything like an analytical inquiry, we are met by the *ex cathedra* statements contained in the same paper "that to such bearing surfaces the ordinary compression moduli of the text books have no application whatever. To apply these constants to the bearing surfaces of spheres or cylinders laid on their sides, or to draw conclusions that pressures exceeding them are therefore dangerous or destructive, is entirely unwarranted, for the attempt has never been made, nor can there well be, to determine the constant for such round bodies, etc. \* \* In good bridge practice it is considered entirely safe to load steel rollers rolling on steel up to the equivalent of 10,000 lbs. per lineal inch for a 33-in. wheel." I heartily wish that all abstruse questions in engineering were so well settled in the minds of engineers as these appear to be in the minds of some of your committee. But I trust that this committee will pardon me if I shall overcome my natural modesty and appeal to those of our members present whose minds are open to conviction to exercise patience while I call their attention to the labors, textbooks and formulae of Prof. Frederick Grashoff, of Karlsruhe, one of whose formulae has been extensively used in this country for determining constants for rollers on plane surfaces in nearly every first-class bridge specification for many years. In making use of these formulae in constructing the following table, the moduli were assumed by me at the values stated, after an examination of the tests made by Mr. Christie some years ago. From the table of tests of steel in the rails of the C., B. & Q., it is seen that the modulus of resistance is somewhat lower than I have assumed in some instances and much greater in others. [This table of tests is not reprinted here.—EDITOR.] I have failed to secure data relating to the moduli of chilled cast-iron, and my table applies only to steel wheels on steel rails. This table is not given as a play upon figures, but as an educator

of the judgment. It has had that effect with me, and I trust it will not be without interest to others.

No words of mine are needed to give weight to the deductions that can be drawn from the table. Of course it is nonsense to contemplate the use of driving wheels 30 ft. and over in diameter to keep within the elastic limit of rails having a rounded head of 12 in. radius. Note what results are given for wheels on flat surfaces, and please bear in mind that these figures apply only to static condition of loads. What should be the practice when we add that indefinite quantity due to momentum or impact, imperfect wheels and track, and unbalanced locomotives at high speeds? It is my claim that this table suggests the remedy, which is, that we should provide a contact between wheel and the flat surface of rail of from  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in. wide, making the total width of head after providing for corner curves from  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in. In arriving at this conclusion I have taken for my factor of safety that given in the use of the value of  $K_3$ , although that derived from  $K_4$  corresponds, in my opinion, more nearly with good bridge practice.

It is true that our rails fail with little material abraded from the top. The fact is, they are crushed after the flow of metal has reached its limit. They fail, like all other crystalline substances, when overtaxed by rapid disintegration, and not abrasion, and it is the exception to find in the scrap heap a rail with the head well worn down.

If this form of rail head should prevail, the indications are that the Sandberg pattern of T rail, with its sacrifice of from one to two pounds per yard in reinforcing the two cantilevers of its head to accommodate splice-bars that in themselves restore the rail to only one-half of its strength as a girder, must be a thing of the past.

Mr. Whittemore inserts at this point a table of tests of rails made on the C., B. & Q., to determine tensile strength,

TABLE SHOWING ALLOWABLE PRESSURES OF WHEELS ON RAILS WITH CURVED TOPS, ALSO ON RAILS WITH FLAT TOP SURFACE, ASSUMING DIFFERENT VALUES OF  $K$  AND IN WHICH FORMULAE:

$K$  = elastic limit per square inch and such portion thereof as may be deemed safe; designated  $K_1$ ,  $K_2$ ,  $K_3$ ,  $K_4$   
 $E$  = modulus of elasticity of wheel.  
 $E_1$  = modulus of elasticity of rail.  
 $R$  = radius of wheel.  
 $R_1$  = radius of rail top.  
 $P$  = allowable pressure of wheel on rail. For rails with curved top the formulæ is:

$$\pi \left( \frac{1}{E} + \frac{1}{E_1} \right) K^2 \sqrt{R R_1} = P$$

For rails with flat top the formulæ is:

$$\sqrt{\frac{32}{9} \left( \frac{1}{E} + \frac{1}{E_1} \right)} K^2 R = P = \text{pressure per lineal unit of tread.}$$

In this table the assumed modulus of wheel tread is 29,000,000, and for the rail, 30,000,000.

Radius of wheel and head of rail.		Weight on wheels according to recent practice.	Assuming the value of $K$ as stated, the weight on wheels can be as follows:				
Wheel.	Rail.		$K = 40,000$ .	$K_1 = 35,000$ .	$K_2 = 30,000$ .	$K_3 = 25,000$ .	$K_4 = 20,000$ .
In.	in.						
35	8		5,722	4,367	3,212	2,225	1,422
35	10		6,398	4,882	3,591	2,488	1,590
35	12		7,068	5,348	3,934	2,725	1,741
35	14		7,750	5,777	4,250	2,944	1,881
35	16		8,433	6,176	4,543	3,147	2,011
35	18		9,116	6,515	4,819	3,338	2,133
30	8		5,298	4,043	2,974	2,060	1,316
30	10		5,923	4,520	3,325	2,303	1,472
30	12		6,489	4,952	3,643	2,523	1,612
30	14		7,068	5,348	3,934	2,725	1,741
30	16		7,647	5,718	4,206	2,913	1,862
30	18		8,226	6,085	4,461	3,090	1,975
27	8		5,026	3,835	2,821	1,954	1,249
27	10		5,619	4,288	3,154	2,185	1,396
27	12		6,156	4,698	3,456	2,394	1,530
27	14		6,649	5,074	3,732	2,585	1,652
27	16		7,108	5,424	3,990	2,764	1,766
27	18		7,539	5,733	4,232	2,931	1,873
24	8		4,738	3,616	2,690	1,842	1,177
24	10		5,298	4,043	2,974	2,060	1,316
24	12		5,804	4,429	3,258	2,257	1,442
24	14		6,268	4,784	3,519	2,437	1,558
24	16		6,701	5,114	3,762	2,606	1,665
24	18		7,108	5,424	3,990	2,764	1,766
21	8		4,432	3,382	2,488	1,723	1,101
21	10		4,955	3,782	2,782	1,927	1,231
21	12		5,429	4,143	3,048	2,111	1,349
21	14		5,883	4,475	3,292	2,280	1,457
21	16		6,298	4,784	3,519	2,437	1,558
21	18		6,649	5,074	3,732	2,585	1,652
16 $\frac{1}{2}$	8	Passenger and sleeping cars, 5,500 to 6,500 lbs.; freight cars from 8,000 to 11,500 lbs., and for rotary snow plows 16,000 lbs.	3,929	2,998	2,205	1,528	976
16 $\frac{1}{2}$	10		4,392	3,352	2,466	1,708	1,091
16 $\frac{1}{2}$	12		4,812	3,672	2,701	1,871	1,196
16 $\frac{1}{2}$	14		5,198	3,966	2,918	2,021	1,291
16 $\frac{1}{2}$	16		5,556	4,240	3,119	2,160	1,381
16 $\frac{1}{2}$	18		5,894	4,498	3,308	2,292	1,464
35	Flat top.		23,243	19,025	15,007	11,482	8,134
30	"		21,519	17,614	14,086	10,630	7,530
27	"		20,415	16,710	13,260	10,085	7,144
24	"		19,248	15,755	12,502	9,508	6,736
21	"		18,006	14,738	11,695	8,895	6,301
16 $\frac{1}{2}$	"		15,959	13,063	10,366	7,884	5,585

elastic limit, etc.; also one compiled by Mr. George Gibbs, Mechanical Engineer Chicago, Milwaukee & St. Paul, which is accompanied by photographs of etched rails that have failed in service. Five of these are reproduced in our engravings, together with the analysis and something of the history of the rails. Mr. Whittemore says that while the appearance of the photographic etchings can be sometimes observed in new rails, owing, as is believed, to faulty manufacture or design, fracture before use did not show such defect of structure. It is the slow but fatal development of an internal organic disease in a structure that is not organic, if we may borrow the idea from a present report, a sort of tuberculosis disease with its slow-forming cavities.

From a scrap heap I have caused sections of rail to be cut which I now offer for your inspection, and in the hope that others than those present will read this paper, I here offer sketches of those sections, that they may see how the rails fail with little abrasion. These rails were of the very best quality, and had been in service from 5 to 8 years. Measurements taken of 20 of them show a wear of less than  $\frac{1}{8}$  in., and a loss of weight of about 1 lb. to the yard. How much of this is due to corrosion, and how much to abrasion, we do not know, but I venture to say that there was twice as much from corrosion as from abrasion. Giving these sections the curve in the head that they originally possessed, and with the web projecting into it, can we devise a better form for splitting the rail from the weight imposed by the wheel than is presented? If my premises are correct we now see why 33 in. and 42 in. wheels under our passenger equipment render so much greater service than we have from the rail, which is subjected to pressures far beyond the elastic limit. The wear of engine drivers shows better results than that of rails, but it must be remembered that there is from two to three times the metal in their cross section that there is in the rail, and that there is a greater field for flow and disposition of stresses; and yet it is not an unheard of thing for driver tires to pipe and split.

The fact is that there is hardly a wheel turning under our freight cars, when loaded to their capacity, or driver under our locomotives, that does not strain the metal in the rail beyond its modulus of resistance. With a modulus of 45,000 lbs. the car-wheel can sustain about 6,000 lbs. within the elastic limit, and this approximates the weight on passenger equipment. Hence the high service shown for the Allen steel-tired wheel.

It is my belief that the fillet curve of the wheel flange should not be the same as the curve of the rail corner, and that the flange pressure should be confined, as near as possible, to the origin of the curve, where abrasion, caused by increase of circumference, is the least, and where the leverage to resist stress is the most effective. We should seriously consider the propriety of adding in any way to the duty of the flange, a projection of only a trifle over an inch which stands between us and disaster.

To me it seems an axiom in mechanics that rolling resistance is decreased with wheels running within the elastic limit. Cylindrical wheels running on a flat topped rail will longer remain of equal diameters than in present practice, and, therefore, the tendency of the wheel to run to flange will not be so great as now. Heretofore the engineer of maintenance of way has had just enough of the aesthetic in his nature to desire to top off his work by graceful curves. Looking at the rail on end in cross section, it is a very small affair, 6 or 8 sq. in. in area, and the change which I suggest involves but a few hundredths of this area, but when looked at in longitude we have over 500,000 miles, every inch of which contains, as I believe, a blunder in design. If this opinion is correct, then it is the duty of our profession to hasten the slow process of evolution and eradicate this evil in the shortest practicable time. That dear old lady, Mrs. Partington, said that when the horse ran away with her she trusted in Providence until the breeching broke, and then she jumped. The traces of our railroads are now at their fullest tension, possessing no factor of safety within the elastic resistance. Have we not trusted in Providence too long in our violation of a law of nature, and it is not our duty to be prepared to quickly leap, not into the dark, but into the light?

#### Millholland's Dump Hand Car.

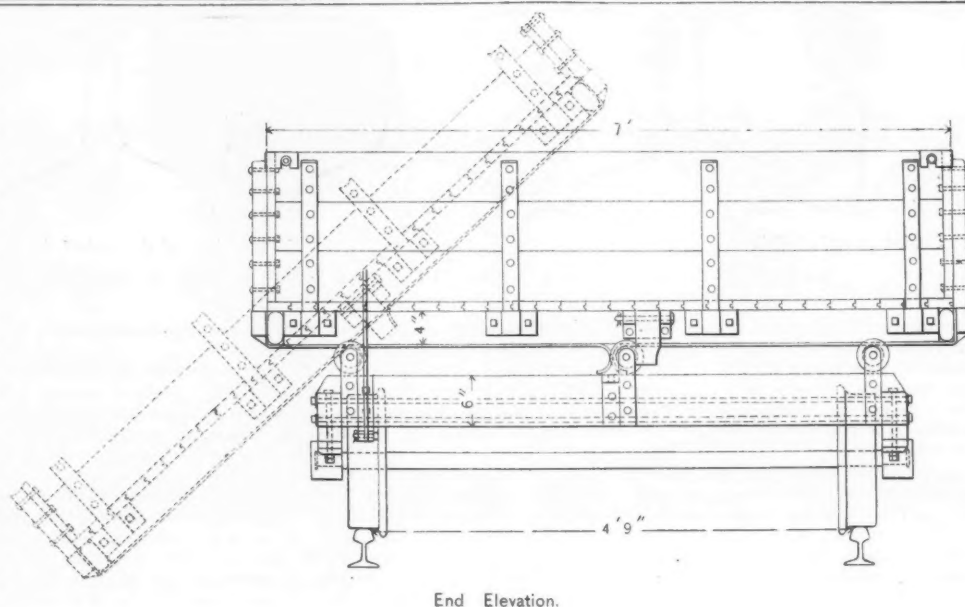
The dump hand car which is shown in the engravings on this page was designed in 1886 for use on the George's Creek & Cumberland Railroad, by Mr. James A. Millholland, General Manager. It has been in use two years with much satisfaction. It holds a little more than three cubic yards of material, and weighs, with the side frames, 1,600 lbs., and 1,400 without them. It is used without the side-boards as an ordinary hand car. It can be easily taken apart and handled by two men. The cars are used by section gangs, or for heavier work in lots with a locomotive, and they have been found convenient for various purposes.

#### Steel Rails—Specifications, Tests and Inspection.

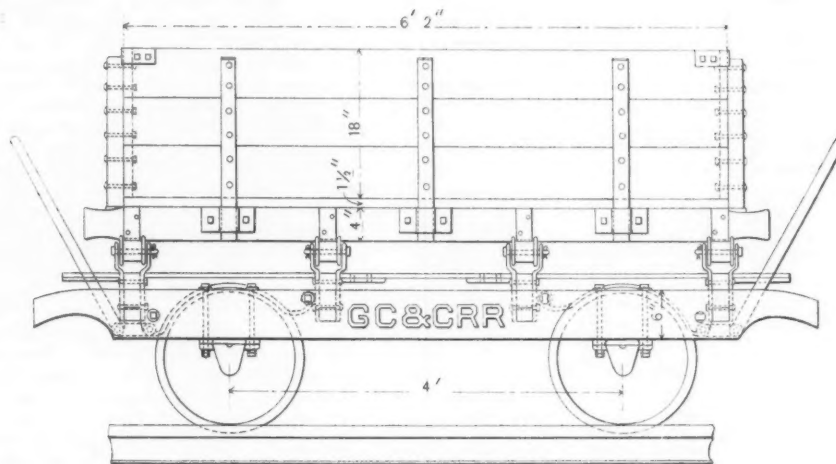
##### II.

We published last week extracts from a number of communications on the above subject from chief engineers of railroads. The *Iron Age* has undertaken to get the opinions of certain rail makers, and what follows is abbreviated from advance proofs of the material collected by that journal:

One maker writes: I have read the specifications through very carefully and find that they correspond so closely with the practice at our works that I really find no opportunity for discussion or criticism. I believe the specifications to be perfectly

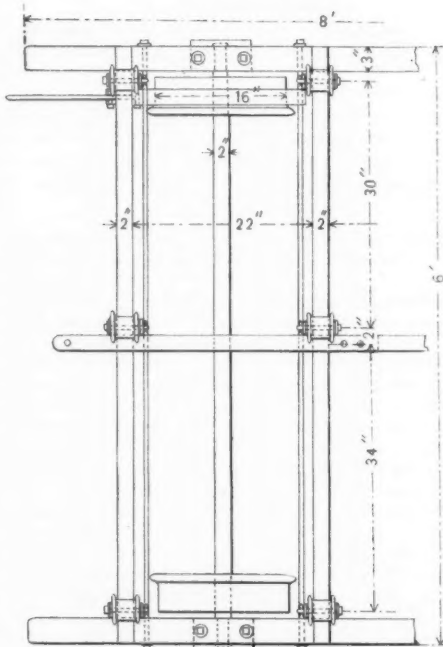


End Elevation.



Side Elevation.

DUMP HAND CAR—GEORGE'S CREEK & CUMBERLAND RAILROAD.



Half Plan of Truck.

fair and reasonable, and if strictly carried out would result in producing good rails, as far as the manufacturer is able to see or provide.

Another mill presents the following views:

I heartily subscribe to most of what Captain Hunt recommends, and think that, with some modifications, his specifications are judicious and reasonable. Up to Sec. 9 I see nothing to criticize. I must say, however, that I am far from having the confidence which he expresses in the style of test recommended in Sec. 9. The breaking angles of test pieces taken in this way are much influenced by the manipulation of the blacksmith and the temperature at which they are hammered out. The varying results thus obtained have caused us to lose confidence in this method of testing, although we still continue its use. The drop test is not so convenient, but is more reliable in showing the strength of the rail as it really is and by indicating the grade of metal which may be advisable for the

particular section which is being tested. The shortcoming of both methods is that, although the strength of the metal may be indicated, the wearing qualities are only indirectly indicated.

In Section 10 it seems to us that unnecessary stress is laid upon keeping the ingot "in an upright position until rolled, or else so maintained until the interior steel has had time to solidify." This would compel abandoning all furnaces in which the ingot is heated in a horizontal position, or else holding the ingot in an upright position until the interior steel had time to solidify before putting into the furnace. This latter alternative would be very objectionable in the light of our practice, as we find that the sooner the ingots are put into the heating furnace after stripping the better they roll, and the colder they are allowed to get before heating the more likely they are to crack in rolling and make second quality rails. It may be injurious to the ingot to throw it violently upon its side in the pit immediately after stripping, but we think it will be difficult to show any injurious effect from placing it (after the top is well set) horizontally upon a car, and transferring in that position to the heating furnace.

Another rail maker writes:

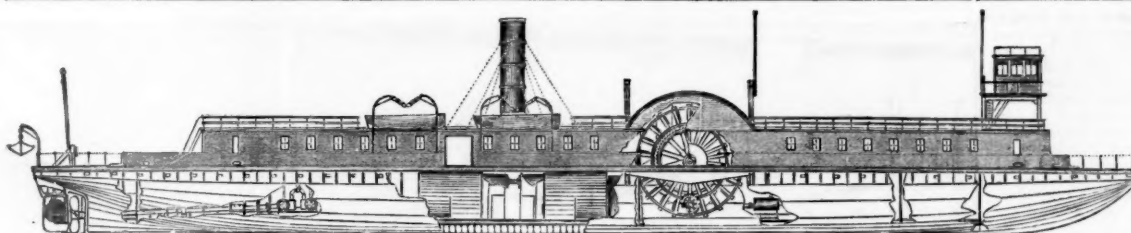
These specifications do not impress me as at all desirable for securing the best results, and they are more an essay on the method of making steel rails, than a clear-cut exposition of what can be reasonably required of steel-rail makers.

The practice hitherto pursued by purchasers has been to follow one of two lines of specifications. The first is to submit the chemical constituents that are demanded in the rails. This is simple and direct, and when the rail maker conforms to this he has fulfilled all that can be required of him. I may say here that the pursuit of this course has proved a very serious failure. The second line of requirement in the manufacture of steel rails is in the purchaser demanding that the steel rails stand certain tests independent of their chemical composition. These physical tests to be applied under the care of the inspector of rails, and if they conform to this condition no complaints can be reasonably made in regard to any other matter.

I hold it as a general principle that while manufacturers of rails are not disinclined to submit all the operations to an intelligent inspector, yet they hold the position in all its strength, that the trained men of the manufacturer are the best agents in assuring satisfactory results in the manufacture of steel rails.

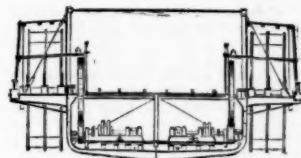
As to the five years' guarantee, no manufacturer of steel rails who has any character at all would tolerate this condition for a moment. If the purchaser insists on chemical and physical tests, and the manufacturer has conformed to these tests to the satisfaction of the inspector of rails, it is quite evident that no further demand should be made of the manufacturer. Parties asking this five years' guarantee intend to cheat somebody,





FERRY STEAMER "TRANSFER"—MICHIGAN CENTRAL RAILROAD.

Built by the CLEVELAND SHIP BUILDING CO., Cleveland, O.



because the manufacturer has no control of the condition of the tracks, and they may put his rails into some miserable mud bed, in which the ends will be hammered to pieces in one or two years, and ask him then to supply rails for those that were unfairly treated by the inadequate ballast of his track; or the business of the road may be increased from the time such guarantee is given, demanding very much more duty from the rails than anticipated in the guarantee; or the increased weight of locomotives and rolling stock may demand a very large increased wear on the rails, which could not be anticipated at the time of the guarantee. On the whole, I would suggest that these specifications need an absolute and entire remodeling, omitting the details of the manufacture of rails in all their conditions. To insist upon one or two series of tests—either chemical or physical, and one of these to be satisfactory to the purchasers, if they come up to the agreement in the specifications for such tests.

The superintendent of a leading mill reviews the specifications as follows:

Under Section 1 to 7 inclusive we see nothing objectionable.

Sec. 8. There is little doubt that rails, with as high percentage of carbon as may be, avoiding brittleness, will give best wear, and, if made of good stock, can be made safe against breakage with a track in ordinary good condition. It is not clear whether this section is intended to stand as it reads in a specification attached to contract, or to have definite carbon limit agreed upon.

Sec. 9. The practice of drawing a bending test piece from a cutting off of bloom commends itself as much to be preferred over test ingots  $3 \times 3 \times 4$  in. There is an inevitable difference in the structure between such small ingots and large ones, especially a sponginess of small ingot. From this cause a specimen taken from a large ingot itself—that is, from the bloom reduced from the large ingot itself—is more truly representative of the material in the rails. Since it is pure accident if a drop test discovers a defective rail, or any quality except either hardness or brittleness, defects are really best guarded against by good regular practice on the part of the manufacturers, and Mr. Hunt's remarks that he should certainly discourage contracting for rails with other than those works whose practice is good, is commendable, and appears to be the keynote upon which the specification is written, outside of the guarantee.

The bending test applied early in the manufacture is a better check for the maker than the drop test can ever be. The drop test, while very simple in operation, is difficult to interpret further than as to hardness or softness. It will furnish a check here, but carbon tests answer equally well, and are applied to every heat, to do which becomes an expense with the drop test.

Bending by blows of the sledge is not good. Bending under a former is more regular, hence a fairer test. The radius of inside curve is not mentioned. It should be given at  $1\frac{1}{2}$  times the diameter of the bar.

Sec. 10, 11 and 12. See remarks under heading of Section 16.

Sec. 13. This touches a point upon which we would consider more information desirable. We note, in a general way, a difference between top and body of ingot, but we are not aware of any careful investigation having been made as to exactly how much steel apparently sound is unreliable or likely to cause battered rail ends.

Sec. 14. This is correct practice, but a still more valuable point to watch, if the trade warranted it, would be the heat at which rails are finished.

Sec. 15 and 16. These imply substantially the constant presence of an expert in rail manufacture at the works of contractor during the execution of an order. If rail experts could be found in sufficient number, and at low enough cost, doubtless the purchaser might be benefited by such inspection. It is believed, however, that it is bad to give the inspector (as inspectors go, or granting a reasonable improvement in the craft) such powers as are given by Sec. 16. Such powers might be safely intrusted to Mr. Hunt himself, and hence makers as well as buyers would be safe under specification and Mr. Hunt; but the specifications strike us as being of a character which needs to be supplemented in the bidder's mind by a knowledge of who the inspector is to be. We consider this to be such a defect as to condemn the specifications for general use.

Sec. 21. With such a guarantee as this, compliance with Sections 8, 9, 10, 11, 12, 13, 14 and 16, or such modifications of the practice therein outlined as the judgment of makers might dictate, may safely be left to the makers themselves. It is not an unusual proceeding for buyers before giving out a large contract to satisfy themselves in regard to the capacity and practice of bidder, and this, it is pretty safe to say, is all that would commonly be done (by deputizing an expert, say in person of Mr. Hunt) under these specifications. Makers do not object to giving intending buyers this kind of information, and would much prefer giving it once for all to the headquarters rather than instruct and train each new young man who may be sent to see that these specifications are enforced. As Mr. Hunt says, if the works' practice is not satisfactory, do not buy their rails.

As a whole the specifications abandon the objective point toward which effort has been directed in the past, and which we think the proper directions to work in, that is, to allow us to cut down the specifications rather than expand them—to specify qualities of product rather than modes of manufacture. They look to a supervision of manufacture rather than an inspection of products as far as concerns quality of material. When buyers insist upon a certain mode of manufacture, it is decidedly unfair to exact a guarantee in addition. As a move

toward improving the inspection business, the specifications are well calculated.

The manager of a large mill says:

I consider the specifications of Captain Hunt as being based on practical experience, and I can see no objection to them, with the possible exception of Section 21. The greatest evil in connection with the maintenance of a good smooth railroad is crushed rail ends. As a rule, crushed rail ends are caused by faulty designs of rail sections and fish-bar connections, and bad roadbed and poor maintenance. If a rail batters at the ends without showing any defects, while the main body of the rail shows good wearing qualities, it is the fault of the railroad. Captain Hunt's specifications, Sections 4 and 18, guarantee almost absolute protection from the evil of split-ends, and at the start of the service of a steel rail, a low joint—viz., a close inspection of the ends, to see they have no short "kinks or droops," and the liberal cropping of the bloom that represents the top of the ingot, giving good, sound material in the bloom. So far as Section 21 is concerned, that is for the mill owners to consider.

#### Steel Ferry Steamer for the Michigan Central.

The Cleveland Ship Building Company, of Cleveland, Ohio, has recently completed a large steel ferry steamer for the Michigan Central Railroad, to ply between Detroit, Mich., and Windsor, Ont. The vessel has some peculiarities of design and is one of the heaviest steel vessels ever built on the lakes, if not the heaviest. The cuts herewith give some idea of the general design. The vessel is 280 ft. long over all, 45 ft. 6 in. breadth of hull, 74 ft. 6 in. across the guards, and 17 ft. 3 in. deep. She is built entirely of steel, except the cabins for crew, which are located on the guards, leaving a clear deck which will take three tracks, each track accommodating seven of the longest freight cars. When light with coal on board, she will draw 9 ft. forward and 10 ft. aft; with 21 loaded cars her draught will be about 11 ft. forward, 12 ft. aft. The pilot house is located on a bridge 19 ft. above the main deck and near the bow.

Her bow is of the most approved form for breaking through the heaviest ice, having a vertical section like a sled runner, and the regular scantlings of the ship are increased in weight and re-enforced with extra keelsons and bulkheads to give the necessary strength.

The hull is covered with a steel deck; has collision bulkhead forward, and bulkheads between store-room and engine-room; between engine-room and boiler-room; between boiler-room and after engine-room, and one at inboard end of stern pipe. Between the bulkheads, belt frames occur on every sixth frame, except for 60 ft. aft of the paddle wheels, where they occur on every other frame, experience having shown that unusual strength is necessary in this place.

The vessel has both paddle wheels and a screw. The paddle wheels are located forward of the centre, 27 ft. 6 in. diameter, with wooden arms and buckets all heavily cased in steel. The aggregate weight of each wheel is 66 tons. The 9 ft. 6 in. propeller wheel in the stern is especially designed for breaking heavy ice.

Each side wheel is driven by a pair of high-pressure engines, geared at right angles to each other, with cylinders 28 in. diam., 48 in. stroke. Engine shafts are geared to paddle wheel shafts by cast steel pinions 5 ft. 4 in. diam., working in spur gears on wheel shafts, 16 ft. diam.,  $5\frac{1}{2}$  ft. pitch. These spur gears are built of cast-iron centres, and arms in two pieces and 12 cast steel segments composing the rim; all bolted, fitted and keyed together.

The propeller in the stern is driven by a pair of engines at right angles; cylinders 28 in. diam., 36 in. stroke, laid horizontal, with separate air pump and condenser. The screw shaft is 10 in. diam. and 52 ft. long, and is greatly inclined, as the propeller wheel projects 12 in. below the hull proper, being protected by a solid forged skag, which carries the bottom pintle of a solid forged rudder.

To protect the rudder when backing into heavy ice there is a heavy forging framed into the hull, immediately above the rudder, and extending down to the top line of it. The forging is covered by the outside plating of the hull, and when backing into heavy ice the rudder is put amidship and a heavy bolt inserted through the forging into the rudder frame from the deck, thus holding the rudder rigidly in a fore and aft direction. The after end of this forging extends down over the after corner of the rudder to prevent ice being driven in between the rudder and the horn.

In the forward engine room is located a beam engine; steam cylinder 16 in. diameter, 36 in. stroke, driving two air pumps and four bilge pumps; the centre column of this beam engine forming a jet condenser, common to both side wheel engines.

About the centre of the vessel are located four marine return flue boilers of the rectangular fire-box pattern, 11 ft. 6 in. diam., 16 ft. long, and carrying a working pressure of 90 lbs. The aggregate grate surface is 252 sq. ft. and 9,828 sq. ft. heating surface. Along the centre line of the ship,

between boilers, are two steam drums connected to a steam separator. The smoke connections are carried to the side of the hull, where they terminate in smoke stacks, one on each side. Coal bunkers are located amidships, between boilers, extending the full length of the boiler room. On account of the great difficulty of getting water when working in ice, this vessel is provided with ten sea cocks, located in different parts of the ship.

Both owners and builders feel confident that this vessel will be able to transfer cars across the Detroit River in the severest weather, breaking through the heaviest ice that can form there. She arrived at Detroit at 2:15 P. M. Jan. 13, and tied up to the Michigan Central dock, having made the run from Cleveland in 11 hours and 12 minutes, running for an hour and a half of that time under a slow check, and breaking her way through 50 miles of ice from 4 in. to 6 in. thick. Her average speed in open water was 12 miles per hour and about 10 miles an hour through the ice. She handles perfectly and steams easily with all her engines at maximum speed. Her side-wheel engines were started at 52 revolutions per minute and her propeller engine at 85 revolutions, making the trip to Detroit without any interruption whatever, excepting only when the speed was slackened by order of the pilot, without heating of journals, alteration or adjustment, from port to port.

The "Transfer," as this vessel is called, was inspected on arriving at Detroit, by President Ledyard, General Superintendent Brown, and Assistant General Superintendent Miller of the Michigan Central. On the voyage over, she was under command of Commodore Innes of the Michigan Central ferry line, assisted by Captain McLaughlin of the passenger steamer City of Cleveland. The machinery was in charge of Chief Engineer Westaway. Among the guests on board were ex-Mayor Geo. W. Gardener and Capt. Geo. W. DeWolf, U. S. Inspector of hulls at Cleveland. Her builders were represented by H. D. Coffinberry, President O. N. Steele, Superintendent of Machine Shops; T. W. Bristow, Superintendent of the ship-yards; and J. C. Wallace, Superintending Engineer. The weather was fine and nothing occurred during the voyage to mar the pleasure of the trip or give anxiety to those most interested.

#### Anti-Friction Metals.

We could give last week, for want of space, but a summary of the discussion which followed the reading of Mr. Bennett's paper before the Western Railway Club. The conclusions reached, so far as any were reached, were given in that summary, but an abstract of the remarks of some of the gentlemen will be found of interest and value.

Mr. SETCHEL: My experience has been that it is economy to use the best material for bearings. For many years while I was connected with the Little Miami road we used brass metal without boring the brasses, but they were thoroughly cleaned of all sand or anything that might become loosened. Then by using strips of babbit they were worn down so that the axle found a natural bearing, with very little or no heating. We very seldom had any trouble with our car brasses heating. But there is another thing which has not been spoken of in this connection, and which I think is very important, and that is, the condition of the journal. You take axles made of rerolled muck bar, while they fill the requirements often put out in specifications of railroad companies of standing a certain mechanical test, notably that of the Pennsylvania road, which is generally the test when any such thing is required—the axle is not of the quality that will make the best bearings. As a rule, the axle is full of short seams, and you may turn that bearing as smooth as you will, and under ordinary speed a bearing of the best quality will run very nicely, but as soon as you put it to a high speed, so that the axle becomes warm, the axle expands and each one of these little openings expands and forms an edge, and then you find it is impossible to keep that bearing cool. Again, very often in the turning the man gives it a cut, and to all appearances it is a smooth journal, but if you watch the motion you will find it partakes largely of the character of a thread, and when you run that axle up to a high speed you find a large amount of friction on account of the thread.

Mr. SARGENT: I have made some experiments as to the difference between a hard bearing as against some of the softer mixtures, and I have here the results of tests made with three different materials as bearing surfaces. I will call them A, B and C, of which A represents one of the hardest in the market, B another hard bearing and C is a representative of a soft bearing. Rating their values as anti-frictional metals, I have for A 100, B 95 and C 53. In another test of the same I got for A an anti-frictional value of 100, B 97, and C 50. In other words I got the least friction with the hardest surface, the hardest bearing. These bearings had all been worn down so that the tests were made under the same conditions. The tests were made with the bearing surfaces as perfect as could be made, and also on a very finely polished steel journal, and they seemed to show conclusively that where the conditions of both journal and bearings are true, the friction is at the minimum with the hardest material.

President RHODES: During the recent brake tests we made a number of train resistance tests, and it was found that with three trains, one composed of C, B, & Q cars, another of Illinois Central cars, and the third of Pennsylvania railroad cars, there was very marked difference in the train resistance. Just what brought about the different re-



sistances of the different trains is questionable, but there is one curious fact about it, that the Pennsylvania train had very hard bearings, the Illinois Central train had a bearing all babbitt lined, and the C., B. & Q. train was lead lined. The differences in the train resistance between these three trains was as follows: The Pennsylvania showed a resistance per ton of 2,000 lbs. of 5.87, the Illinois Central 6.22, and the C., B. & Q. 7.51. Another train which was composed of St. Joseph and St. Louis cars showed a train resistance of 12 lbs. I cite this latter case, because we determined that 12 lbs. resistance in order to show the difference between it and 5.87. It meant that the train with the 12-lb. resistance per ton had a grade to climb of 20 ft. per mile more than those others with smaller resistances. That brings up this question, that, when the railroad companies are straightening out the tracks and cutting down the grades, they must look after the motive power department, which department may be raising a grade of 5 or 10 ft. per mile. To give an idea of the difference in hauling the train with a resistance per ton of 5.87 as against 7.51 I find, from the brake report, that this difference, insignificant as it would appear, would, in running 1,000 miles, necessitate an extra amount of haulage power equivalent to surmounting summits 4,330 and 3,415 ft. high respectively, or greater than that of any line between the Mississippi and the Atlantic. I do not say that those resistances are all due to the bearings, but it is rather curious that the resistance of those trains should have been in that proportion corresponding with the points brought out at this meeting, showing that there is less frictional resistance with hard metal than there is with soft.

Mr. SARGENT: I found, in making the experiments that I have referred to, that everything depended upon the amount of oil on the journal. At the brake tests the Pennsylvania axles were much better lubricated than any of the others. I noticed also, in my tests, that the rate of heating with the softer bearings was about 70 per cent. greater than that of the hard bearings. It used to be considered that soft bearings were very valuable in preventing hot axles.

Mr. BARR: Our practice is to use a brass shell, lined with a mixture of lead and antimony. We use the same oil that we did three years ago. We have had this practice in general use for probably two years, and the hot bearing record would indicate that we have not over half so many hot bearings at present as we had two years ago, with a very material reduction in the consumption of oil, the same oil being used during the entire period. I think that a test with a mechanically perfect bearing, with a mechanically perfect axle and thorough lubrication, throws very little light on what you may expect in actual practice. We never have those circumstances. We haven't a perfect journal, nor a perfect fitting bearing, and we are sometimes a little slack of oil, and we have got more or less dirt and grit to contend with. All these points have to be taken into consideration, and these points have conspired together to make us feel satisfied that a soft bearing gives the best general results. Of course, this matter of bearings is a complicated question, as it involves a consideration of the consumption of oil, the consumption of waste and the wearing of journals. It is difficult to reach a definite conclusion on it, but I believe that taking the general practice of railroads into consideration, the necessity of getting trains over the road on time, the requirements of the transportation department, that a soft bearing is going to see you to the end better and safer and cheaper than a hard bearing. At the same time I do not feel at all inclined to deny that a hard bearing, with a properly fitting journal, will give you better theoretical results than anything soft. I have paid considerable attention to this matter, at one time placing hard bearings on one journal and a soft bearing on the other. I found that the hardest bearing decreased in weight the fastest, and the soft bearing decreased in weight the least; also that the softest bearing reduced the axle in diameter at a considerably greater rate than the hard bearing. Those two results, increased wear of the journal by using the soft bearing and reduced life of the bearing in using the hard bearing, to a certain extent counterbalance each other, and I am not prepared to say where we shall be able to strike the happy medium that will give us the best results. In fact, in general practice I do not think we can strike that medium. We must get the trains over the road in the first place, and the soft bearing does that, and, I believe, does it with less oil than the hard bearing, probably enough less to pay for the other losses.

Mr. HIGGONSON: The more you experiment the more contradictory results you seem to find. In most all of the records I have they show less friction for the soft bearing, and also the feature just spoken of, greater journal wear. Those two statements appear to be almost paradoxical, but it appears that they are true.

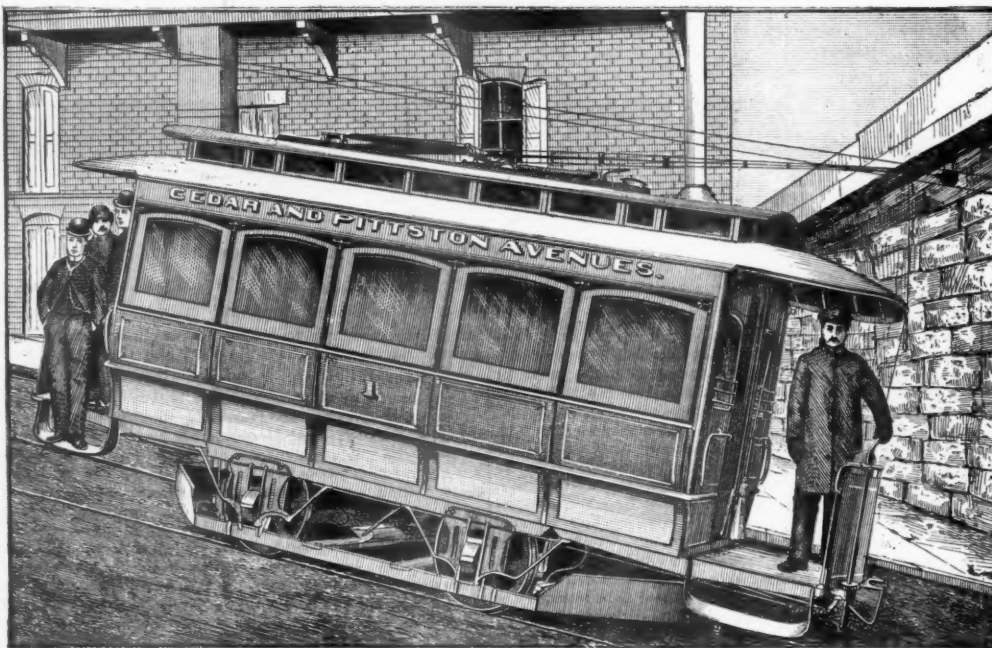
Mr. VERBRYCK: Some years ago I was a great advocate of a hard metal bearing. I considered that even if the soft metal would give the greater mileage, it wore the journals down much faster, so that there would be no profit, but we made a test with a soft bearing on our passenger cars, and to my great surprise I found that with the soft bearing we were using the journals did not wear so much as with hard brass and with less heat, and I have for several years had very great success in mileage, lubrication and everything. At that time and for several years we used a metal made for us by one particular man. We furnished the shells and he filled them. But finally he stopped making them, and then we were all at sea, and I have never been able to get such success since. One year I had an average mileage of 158,000 miles, and since that I have never been able, with other metals I have tried, to get an average of over 75,000 or 80,000 miles. We had no hot boxes, either, on our passenger cars on the main line for two or three years. Before using these bearings we had been having a great many hot boxes. But we are now unable to get that metal, and don't know what it was. Once in a while I still use some of that same metal that we have taken out of old bearings, and I get just about as good results as we did at that time. With our freight cars you will perhaps be surprised to hear that we have been having the best success with straight brass.

Mr. HICKEY: I think, Mr. President, when a journal is new there is no question but the hard metal is the most desirable, and will run with least friction, but when a journal runs a long time and becomes worn and is no longer true, you must resort to something else. It is not supposed that the railroad companies have men on the road competent to fit brasses. I cannot see that there is anything to do but put in a soft metal and let it adjust itself. It seems to me that that is the reason for using a soft metal, not that we believe it runs with any less friction than the hard metal.

Mr. TOWNSEND: Mr. Barr's experience is much like mine. I have used shell brass, filled with lead and antimony, but a peculiar kind of lead. We have kept changing so that, on our road I don't suppose we have now a solid brass on the whole line. Our alloy is  $\frac{1}{2}$  parts lead, one part antimony; we use Omaha lead; ordinary lead will not do.

Mr. BARR: We use the same as Mr. Townsend. With some of our passenger engines, which are heavy on trucks, we had great trouble from heating; no amount of attention would make them run cool. Since using tin and antimony, hot boxes are practically unknown.

Mr. VERBRYCK: Soft metal presses out; if it laps around the journal there will be a hot box.



ELECTRIC CAR ON THE SCRANTON STREET RAILWAY.

Mr. SCHROYER: We use a brass shell filled with babbitt, eight parts tin and two of antimony with a little plumbago. Anti-frictional metals do not afford a complete remedy; much depends on oil. Our passenger trains use a paste compound while the freight department uses oil, and has less hot boxes. We keep a record, having oiling points all along the line; we had so much trouble with the Master Car-Builders' solid brass, trains being delayed, that we had to change, and now use the same as the Alton and other Chicago roads. Unless a record is kept showing the number of hot boxes in proportion to the number of bearings in service, no comparisons can be made.

Mr. TOWNSEND: Hot boxes anywhere on the road are reported to me by wire at once. We have very few. Besides good metal, it is necessary to have good dust guards and trucks square.

Mr. VERBRYCK: We don't allow trainmen to oil boxes, except when warm; if a box on the road is a little warm, they put in a gill of oil.

Mr. BARR: I think we had about 1,000 hot boxes in freight service last year. Three years ago we had three times that number; the improvement is owing to the use of soft bearings, also to the requirement of regular reports. The report enables me to go to the last inspecting station and stir the men up. Possibly this is as important as soft bearings.

Mr. RHODES: One of our long baggage cars with four-wheeled trucks recently gave us much trouble. The pressure on the journal was 420 lbs. per sq. in. Our practice with baggage cars, when they exceed 350 lbs. to the sq. in., is to put in six-wheeled trucks. Cars of 60,000 lbs. now built, when fully loaded on 4 x 8 journals, have a pressure of 352 lbs. per sq. in.; the Master Car-Builders'  $3\frac{1}{2}$  x 7 journal, loaded to 40,000 lbs., had 312 lbs. The large loads now carried make this question important, and it will have to be met at the next meeting of the Master Car-Builders' Association.

#### Some of the Latest Electrical Railroads.

The Omaha & Council Bluffs Railway & Bridge Co. started its cars the last of November, and they have been in daily operation since, to the satisfaction of the owners and the general public. The cars on this road are run at a speed of 15 and often 20 miles an hour. The power plant consists of two 80 and one 40 h. p. generators. This is one of the finest electric railroads in the West.

The Des Moines Broad Gauge Railway Co. (Thomson-Houston system) has been in operation since Dec. 20, and very successfully. In the first trial trip made on this road, the car had a load of 87 passengers, and the rails were thickly covered with mud in many places; but these had no serious effect upon the operation of the car, which mounted the grades and rounded the curves with perfect ease. The total mileage is 7.5 miles, and eight cars will be operated. During a severe snow-storm in Des Moines, when about one foot of snow fell, the motor cars made their regular trips every 15 minutes. The horse cars put on four horses, but could not run on time then, and the steam motor which runs out into the north end of the town was ditched, so that the electric cars were the only ones operating during the storm. The receipts from four motor cars on this road are four times more than from five cars operated by horses.

The Third Ward Street Railway Co., Syracuse, N. Y., which is operating the Thomson-Houston system, has been somewhat delayed by difficulties connected with the track construction, but is now in operation and has eight cars and four miles of track.

The Riverside & Suburban Railway Co., Wichita, Kan., has operated successfully since starting, and has stood all the tests of bad weather and muddy and frozen streets, never having lost a single trip. The track is built of Johnston rails within the city limits and the ordinary "T" rail outside. There are three cars in operation, each equipped with the Thomson-Houston motors and lighted with electric lamps.

The Eckington & Soldiers' Home Railway, at Washington, D. C., has been in operation since the latter part of October, and thus far without a hitch of any kind which can be laid to the electrical apparatus. The patronage of the road has increased to such an extent that it has been

necessary to double the car capacity. Each motor car now tows an additional car, both of which are filled to their utmost capacity at every trip. The road is the finest which has been built in the United States.

Three of the improved Thomson-Houston trucks have been in use for some time past on the Scranton Suburban Railway, and the manner in which they operate has been the occasion of much favorable comment. Each truck has two 15 h. p. motors. The first one was shipped early in August, and was used under a large open car, and frequently carried up the heaviest grades a load of 75 people, and on several occasions more than one hundred people. The truck was afterwards put under a heavy Pullman car, which weighs almost as much empty as an ordinary street car does when loaded, and its operation under this car was equally satisfactory. This road has many curves and heavy grades, and the motors are called upon to do some very heavy work; but they proved themselves to be perfectly reliable and abundantly able in every way to supply the demands made upon them.

The illustration herewith shows a car on one of the heavy grades of the Scranton road.

#### New Mileage in 1888.

We present here with a table showing the new track laid in the year 1888. The table also shows lines under construction at the close of the year and those projected for next season. With but few exceptions, the figures are, like those in the two previous tables which we have published this year, compiled from information furnished us from official sources. Only these projected lines are given upon which it seemed likely that considerable work would be done.

Alabama.....	334.5	New Mexico.....	105.
Arizona.....	36.	New York.....	81.6
Arkansas.....	43.	North Carolina.....	193.5
California.....	48.1	Ohio.....	134.77
Colorado.....	222.38	Oregon.....	124.
Connecticut.....	17.5	Pennsylvania.....	92.
Dakota.....	158.05	South Carolina.....	198.5
Delaware.....	11.	Tennessee.....	188.
Florida.....	166.54	Texas.....	184.7
Georgia.....	430.	Utah.....	8.
Idaho.....	8.6	Vermont.....	22.5
Illinois.....	272.16	Virginia.....	95.
Indiana.....	45.	Washington Territory.....	73.7
Indian Territory.....	98.	West Virginia.....	37.61
Iowa.....	31.66	Wisconsin.....	182.18
Kansas.....	524.64	Wyoming.....	24.7
Kentucky.....	403.25		
Louisiana.....	101.	Total, U. S.....	6,885.16
Maine.....	123.3	Quebec.....	124.
Maryland.....	2.98	Ontario.....	73.
Massachusetts.....	8.	Manitoba.....	32.
Michigan.....	306.16	New Brunswick.....	30.
Minnesota.....	300.10	Nova Scotia.....	37.
Mississippi.....	72.5	Northwest Territory.....	25.26
Missouri.....	317.2	Mexico.....	521.
Montana.....	124.06		
Nebraska.....	145.52	Total, foreign.....	885.96
New Hampshire.....	2.	Grand total.....	7,771.12
New Jersey.....	26.3		

#### THE SCRIP HEAP.

##### Notes.

The affairs of the Housatonic Rolling Stock Co. have just been closed up at Bridgeport, Conn., stockholders receiving \$7.44 per share.

William Leighton, Section Foreman of the Harrisburg Division of the Pennsylvania, on the recent inspection received the second premium for the fifth consecutive time. He has also received the first premium for the best piece of road between Harrisburg and Newport, 30 miles.

A bill has been introduced in the Kansas Legislature giving the Railroad Commissioners supervision over telephone and telegraph lines, and sleeping car and express companies, with power to fix rates.

In consequence of the derailment of a passenger train at Brookhaven, Miss., recently, where a maliciously misplaced switch turned a passenger train into a lumber factory, which was set on fire and burned, the Illinois Central has spiked down its switches at a number of private sidings along its line in that region. This action inconveniences a number of lumber shippers, and is thought to be a move-



## NEW CONSTRUCTION, JANUARY 1 TO DECEMBER 31, 1888.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction or projected for next season.		
	From	To	Miles	From	To	Miles
Albemarle & Pantego.	Juniper Landing, N. C.	Southward.	6			
Allegheny & Kinzua.	Smith's Junction.	Coffee Run, Pa.	11.5			
Americus, Preston & Lumpkin.	Redhouse Junc., N.Y.	Freck's Mill, N. Y.	9			
Anniston & Cincinnati.	Attala, Ala.	Near Anniston, Ala.	35	Louvale, Ala.	Montgomery, Ala.	100
Arizona & Southeastern.	Fairbank, Ariz.	Bisbee, Ariz.	36			
Atchison, Topeka & Santa Fe—California Central.	Inglewood.	Redondo Beach, Cal.	10.3			
"	Ballona Junction.	Orange, Cal.	29.5			
"	San Juan, Cal.	Los Angeles Junc.	22.7			
"	Perris, Cal.	San Jacinto.	19.4			
Chicago, Kansas & Western.	San Bernardino.	Mentone, Cal.	5.6			
South, Kansas.	Concordia, Kan.	State line, Kan.	37.6			
South, Kansas & Texas.	(Frontenac Ext'n.)	Pittsburgh, Kan.	2.8			
South, Kansas & Panhandle.	End of track.	Panhandle Co., Tex.	4.5			
Atlanta & Florida.	Englewood, Kan.	Fort Valley, Ga.	77			
Atlantic Coast Line—Wilmington & Weldon.	Fayetteville, Ga.	Fort Valley, Ga.	77			
Fluorence.	Scotland Neck, N. C.	Bethel, N. C.	26			
Manchester & Augusta.	Dillon, S. C.	Rowland, N. C.	19			
Atlantic & Danville.	Sumter, S. C.	Franklin, Va.	49	Franklin.	Lawrenceville, Va.	50
Atlantic & Western of Florida.	W. Norfolk.	Franklin, Va.	49	New Smyrna, Fla.	Corona Beach, Fla.	3
Austin & Northwestern.				Burnett, Tex.	Marble Falls.	17
Baltimore & Drum Point.				Baltimore.	Millersville, Md.	35
Baltimore & Ohio.	Carroll Switch.	Clifford, Md.	2			
Berkley Springs & Pot.	Hancock St., W. Va.	Berkley Springs, W. Va.	6	Pen Argyle, Pa.	Wind Gap, Pa.	2.5
Bangor & Portland.						
Barre.	Barre, Vt.	Quarries, Barre, Vt.	6.5			
Batesville & Brinkley—Augusta & Southeastern.	Barre Junction.	Barre, Vt.	4			
Bay of Chaleurs.	Coats, Ark.	Lone Grove, Ark.	3	Carleton.	Paspebiac, Que.	60
Beaver Creek & Cumb. Coal Co.	Matapedia.	Carleton, Que.	40	Billings, Mont.	Coal mines, Yoseys, S. C.	51
Billings, Clark's F. and Cooke C.	Near Greenw'd, Ky.	Carleton, Que.	2	Wagener, S. C.	Seivern, S. C.	5
Bishopville.	Scarboro' Mill, S. C.	Shaw's, S. C.	8			
Blackv., Alston & Newberry.	Salleys, S. C.	Wagener, S. C.	8			
Bloomburg & Sullivan.	Benton, Pa.	Janison City, Pa.	10			
Boston, Wintth. & Shore.	Winthrop, Mass.	Revere.	3			
Brantford, Waterloo & Lake Erie.				Brantford, Ont.	Waterford, Ont.	17
Brookv., Westport & S. S. M.	Lynn, Ont.	Westport.	18	Lynn.	Brookville.	7
Brookfield.				N. Brookfield, N. Y.	Brookfield.	7
Brooklyn Bath & West End.	Blythbourne.	City line.	1.5			
"	Unionville.	City line.	1			
"	Brooklyn.	Bath Junction.	1			
Cairo & Northwestern.	Goshen, Ind.	Sturgis, Mich.	29	Cairo, Ill.	East Cape Girardeau.	40
Canada & St. Louis.	Sturgis, Mich.	Battle Creek.	39	Goshen, Ind.	Danville, Ill.	60
St. Louis, Sturgis & Bay City.	Midland.	West Bay City.	18	Midland.	Battle Creek, Mich.	92
Battle Creek & Bay City.	Farnham, Que.	Lennoxville, Que.	61	London, Ont.	Windsor, Ont.	112
Canadian Pacific.	Fort, Me.	Mattawankeag, Me.	12			
"	Guelph Junction.	Guelph, Ont.	12			
"	Dorval.	Pass. Depot, Mont.	8			
Cape Breton.				Canso, C. B.	North Sydney, C. B.	100
Cape Fear & Yadkin Valley.	Toms Creek.	Mt. Airy, N. C.	11.75			
"	Stokesdale, N. C.	Madison, N. C.	11	Fayetteville.	Wilmington, N. C.	80
Cape Girardeau, S. W.	Wappapello, Mo.	Chaonia, Mo.	6	Williamsville, Mo.	Hunter, Mo.	23
Carolina, Cumb. Gap & Chik.	Chaonia, Mo.	Williamsville, Mo.	14			
Carolina, Knoxville & Western.	Edgemoor, S. C.	Edgemoor, S. C.	25			
Carthage & Adirondack.	Greenville, S. C.	Northward.	15			
Central of Georgia.	Blakeley, Ga.	Columbia, Ala.	12	Jayville, N. Y.	Little River, N. Y.	14
Savannah & Western.	Clayton, Ala.	Ozark, Ala.	35	Buena Vista.	Columbus, Ga.	35
Columbus & Western.	Sylacauga.	Cahaba River.	37	Eden, Ga.	Eastward.	7
Central (New Brunswick).	Hampton.	St. Martins, N. B.	39			
Central Vermont.	Barre, Vt.	Williamsstown, Vt.	93			
Charl., Cin. & Chicago.	Near Canades, S. C.	Blacks, S. C.	93	Rutherfordton.	Johnson C., Tenn.	107
Chattanooga Union.	Richardson, Ky.	White House, Ky.	8.5	Burgess.	Sherman Heights.	1.5
Chattanooga & Look Mt.	Orchard Knob.	Burgess, Ky.	2			
Chatt., Rome & Columbus.	St. Elmo.	Mountain Junc., Ky.	7.5			
Chesapeake & Ohio.	Chattanooga, Tenn.	Lookout Mt.	10			
Mayfield & Big Sandy.	Chattanooga, Tenn.	Carrollton, Tenn.	119			
Elizabethtown & Hodgenville.	Ashland, Ky.	Newport, Ky.	145			
Troy & Tiptonville.	Elizabethtown.	Hodgenville, Ky.	11	Troy, Tenn.	Tiptonville.	20
Chicago, Burlington & Quincy—Ill. Valley & No.	Moffatt, Tenn.	Troy, Tenn.	5			
Burlington & Missouri River.	C. I. & I. Crossing.	Triconia, Ill.	30			
"	Blakeman, Kan.	St. Francis, Kan.	38.74			
"	End of track.	Ericson, Neb.	1.47			
Chic. & Eastern Illinois.	Neb. City, Neb.	Alliance, Neb.	19.00			
Chicago & Grand Trunk.	Monmouth, Ill.	Across new bridge.	8.85			
Chicago, Milw. & St. Paul.	Goodland, Ind.	C. & W. I. Junction.	36			
"	Junet, Elsdon, Ill.	C. & W. I. Junction.	4			
"	Alva, Wis.	Withee, Wis.	2.38			
"	Lapham, Wis.	Zeda, Wis.	2.66			
"	Maquoketa, Ia.	Hurstville, Ia.	2.34			
Chicago & Northwestern.	Evanston, Ill.	Northward.	1.63			
Fremont, Elkhorn & M. V.	Marion & Ced. Rap.	Cut-off.	2.22			
Wyoming Central.	Lake Geneva, Wis.	Williams Bay, Wis.	33			
Chicago, Rock Island & Pacific—Chicago, Kansas & Nebraska.	Ishpeming, Mich.	Republic, Mich.	45.3			
"	Geneva, Neb.	Superior, Neb.	12.3			
"	Creighton, Neb.	Verdigris, Neb.	24.7			
Chic., St. P. & Kans. City.	Glen Rock, Wy.	Casper, Wy.	24.7			
Chino Valley.						
Chowan & Southern.	Phillips Co., Kan.	Kanorado, Kan.	140.3			
Cin., Ham. & Dayton—Col. Finlay & Nor.	Kanorado, Kan.	Colo. Springs, Colo.	167.3			
Cin., Jackson & Mack.	Kingsdown, Kan.	Near Liberal, Kan.	81			
Clarendon & Pittsford.	In St. Joseph, Mo.	Pond Creek, Ind. T.	21			
Cleaveland & Jefferson.	Ontario, Cal.	Southward.	10			
Cleve., Akron & Columbus.	Norfolk, Va.	Drivers, Va.	13			
Cleve., St. L. & Kans. City.	Branch.		10			
Colorado Midland.	McComb, O.	Findlay, O.	9			
"	Carlisle, O.	Franklin, O.	2			
Aspen Short Line.	Center Rutland, Vt.	Proctor, Vt.	1			
Columbia & Greenville.	Horatio, Pa.	Northward.	1			
Columbia, Newbury & Lan.	Warsaw, O.	Dresden Junc., O.	11	Coal Branch.	Boonville, Mo.	3
Columbia Southern.	Maroon, Col.	Aspen, Col.	2	Alton, Ill.	Boonville, Mo.	160
Coronado.	Glenwood Spgs.	New Castle, Col.	13			
Cooperstown & Susquehanna V.	Aspen.	Smuggler Mt.	7			
Coshocton & Southern.	Crystal Lake.	Arkansas Junc.	2			
Covington & Macon.	West Union, S. C.	Walhalla.	2			
Covington Transfer.	In Columbus, Ga.		19	Columbia, S. C.	Spartanburg.	42
Cumberland Ry. & Coal Co.	Coronado, Cal.	San Diego, Cal.	18	Columbus, Ga.	Albany, Ga.	87
Cumberland Valley.	Monticello, Ga.	Athens, Ga.	61	Cooperstown Junc.	Davenport Centre.	8.5
Davenport, Iowa & Dakota.	Covington, Ky.	Towards Oxford.	11	Coshocton, O.	Zanesville, O.	30
Dayton & Faunsdale.	Spring Hill, N. S.	Oxford.	22.5	End of track.	Wichester, Va.	75
Deadwood Central.	Davenport, Ia.	Cedar County, Ia.	30	End of track.	Anamosa, Ia.	8.5
Deer Creek & Susque.	At Deadwood, Dak.		3	Dayton, Ala.	Faunsdale, Ala.	8.5
Denison, Bonham & New Or.				Belair, Md.	Stafford.	20
Denver, Texas & Ft. Worth.	Trinidad, Col.	Texas state line.	125	Denison, Tex.	Honam, Tex.	20
Ft. Worth & Denver City.	Washburn, Tex.	Panhandle City.	14.5	Trinidad, Col.	Coal mines.	20
Detroit, Bay City & Alpena.	Branches.		9			
Detroit, Lansing & North—Grand Rapids, Lans. & Det.	Mulliken, Mich.	Thornapple River.	32			
Dexter & Piscataquis.	Oakdale Park.	Reeds Lake, Mich.	2			
Dodge City, Mont. & Trinidad.	Dodge City, Kans.	Montezuma.	28	Dexter, Me.	Dover, Me.	16
Duluth & Iron Range.	Tower Mines, Minn.	Ely, Minn.	21	Montezuma.	West.	50
Duluth, Red Wing & South.	Red Wing, Minn.	South.	10	End of track.	Albert Lea, Minn.	74
Duluth, South Shore & Atl.	Bad River.	Iron River J'n, Wis.	40			
"	Superior, Wis.	W. Superior, Wis.	3.76			
"	Negaunee.	Palmer, Mich.	6			
"	Main line.	Gogebic iron mines.	6.5			
Duluth & Winnipeg.	Cloquet, Minn.	End of track.	20			
East Louisiana.	Abita Springs, La.	Covington, La.	4			
Eau Clair, Wis. & L. Superior.				Eau Clair, Wis.	Independence, Wis.	36

ment for the purpose of stirring up the authorities with a view to capturing the criminals.

On Jan. 18 the District Attorney at Mauch Chunk, Pa., presented a new bill containing six counts against Henry Cook, engineer of the train that crashed into the excursionists at Mud Run on Oct. 10, the original indictment having been defective. General McCartney, counsel for Cook moved to quash the indictment for the reason that the counts thereof do not specially set forth what rules and precautions defendant refused or neglected to obey. The motion to quash was denied by the Court. The Court then adjourned the case to a special term to be held in March next. The grand jury returned true bills of indictment against engineer Major and flagman Hannigan. The cases against conductors Terry and Keithline and lockouts Mulherne and Foble were ignored, the costs being placed upon the county.

A bill for the regulation of railroads has been introduced in the Wisconsin legislature. The long and short haul clause of the Inter-state law is copied verbatim, as well as many other features. The issuance of all passes except to employees and to the Commission and its Secretary is strictly forbidden. The Commission shall have power, in case of complaint of unjust or discriminating rates, to fix new rates which shall be *prima facie* reasonable.

## Sleeping Cars on the Atchison.

A Boston dispatch states that the contract between the Atchison, Topeka & Santa Fe and Pullman's Palace Car Co. has been revised, and that the tourist (second class) sleeping cars, on not only this but the other trans-continental lines, are to be placed under the control of the Pullman Co. The Atchison road has hitherto paid the Pullman Co. three cents per car per mile and kept the cars in repair. By the new agreement the rate is two cents a mile and Pullman does the repairs. The road owns a half interest in the cars, which will be sold to Pullman for \$650,000.

## British Board of Trade Returns and Exports of Iron.

The Board of Trade returns for 1888 show a total value of imports of £386,582,056, an increase over 1887 of 6.8 per cent. The value of exports for the same time was £233,733,937, an increase of 5 per cent. The total exports of iron and steel were valued at £26,372,755, an increase of 5.5 per cent., while the value of imported iron and steel was £1,138,210, an increase of 2.3 per cent. The iron and steel showing is particularly satisfactory, as with the rise in price there has been a fall in quantity of 4.2 per cent., or in other words, from 179,123 tons less iron and steel, the receipts have been £1,380,441 greater. This is explained by the fact that the shipments to this country, which have declined 684,102 tons, had, in 1887, according to the *Iron Trade Circular*, a value of from £2 to £4 per ton, the material shipped in substitution has had a value of from £5 10s. to £7 or £8 per ton. That is, the iron and steel taken by other markets has been more advanced by manufacture than that taken by us. The principal items for the two years are as below:

## Shipments of Iron and Steel from England to the United States.

	1887.	1888.
	Tons.	Tons.
Pig iron.	403,500	445,816
Bar, angle and rod iron.	4,273	4,254
Railroad iron.	182,232	51,173
Hoops, sheets and plates.	32,472	46,354
Old iron.	171,335	25,040
Unwrought steel.	215,634	66,550
Cast and wrought iron.	2,923	4,748
Iron rails.	210	
Steel rails.	177,421	49,262
Tin plates.	298,335	292,623
Steam engines and jacks (value).	446,221	427,110
Other kinds of machinery.	429,539	540,804
Hardware and cutlery.	387,339	364,561

The greatest value taken by any one country was tin plates, by the United States, £4,087,147 and the total value of tin plates exported was £5,536,310. The total value of steel rails was £3,064,326. The coal and fuel exported was valued at £11,349,832, engines at £3,456,940, and other machinery at £9,475,685. Railway carriages and trucks exported are valued at £1,502,956 a value which has never been exceeded.

## The Rusting of Iron.

Mr. Crum Brown explains in the following manner the chemical reactions which produce iron rust: When a drop of rain falls upon the smooth and polished surface of a piece of iron, the water changes color and a non-adherent brownish-red precipitate is formed. Water free from oxygen and carbonic acid does not produce any effect upon iron at ordinary temperatures. At high temperature; water or steam oxidizes iron rapidly to the state of ferric oxide,  $Fe_2O_3$ . This oxide forms an adherent coating, and the action ceases until the coating is removed. Gaseous oxygen at ordinary temperatures does not affect iron, but when heated its action is the same as that of steam. Carbonic oxide at ordinary temperatures does not act upon iron, but at high temperatures it is reduced to carbonic acid, and the iron is oxidized. Water which contains oxygen alone produces no action upon iron. A piece of iron can be preserved indefinitely in lime water, if carbonic acid cannot be produced. Water charged with carbonic acid, and free from oxygen, dissolves iron into a bicarbonate, setting free the hydrogen. The presence of oxygen oxidizes this bicarbonate, and ferric oxide is precipitated. The carbonic acid set free can again act upon the metal, and an addition of oxygen will dissolve the bicarbonate thus formed.

## Stealing Rails.

Serious thefts have just been brought to light on the Pennsylvania. It appears that J. B. Cox, Assistant Supervisor of the New York Division, and W. A. Howell, Supervisor, have for some time been collecting old ties and rails along the division, disposing of them to private parties, and appropriating the funds, amounting to over \$8,000, to their own use. Both men have been arrested and placed under bail. The rails, some of which were unused, were sold to a renton Steel & Iron Works. A truckman in the employ of the steel and iron works, making one of his accustomed visits to the piles of rails strewn along the division, was about to carry some away when accosted and compelled to explain. He said he had been doing that sort of thing for long time, and became indignant at being interfered with.

## Ship Canal to Brussels.

The increase of traffic on the Main and the growing commercial importance of Frankfurt since the improvement of that stream, with the successful financing of the Manchester canal, seems to have turned the attention of other cities to an improvement of their waterways. Brussels is now aspiring to the title, "Bruxelles, Port de Mer." The proposition is to cut a canal directly to the river Rusele, some distance above its junction with the Scheldt, where it would be on the level of tidal influence, starting at Brussels about 110 ft. above the sea. At a meeting lately held at the Brussels Bourse, the President, de Vergnier, reported that great progress had been made



with negotiations, in favor of the canal, with both the new Minister of Belgian Public Works and the municipality of Brussels. M. Gobert, an honorary engineer of mines, addressed the meeting, urging, among other things, that as the state railroad between Brussels and Antwerp was already surcharged with traffic, it would be cheaper to build the canal than double the railroad, and would reduce the cost of carriage, by which the railroad would ultimately be the gainer, and lastly that anything which strengthened Brussels would strengthen the whole kingdom.

#### Bill Nye's Obituary of Mr. Weeks.

Mr. Weeks was a self-made man and, even in his most prosperous days, would not allow finger bowls in his house. His education was mostly in the line of the business he had adopted, and though he did not know that evolution was a gradual change from an indefinite and incoherent heterogeneity to a definite and coherent homogeneity, through constant differentiations and integrations, a flat wheel would wake him out of a sound sleep before it had made two revolutions.

#### Express Rates.

The rate war between the express companies now covers a large territory. Rates from New York, Boston and Philadelphia to St. Paul, Minneapolis and all points on the Missouri River have been cut from \$4 to \$1.75. From Chicago to the same points rates are cut from \$2 to \$1; from New York and Boston to Chicago, from \$2.50 to 75 cents, and at many other places rates have also been cut in proportion.

#### Official Correspondence.

The letter given below is, like the production of Jerry McNulty, printed recently, open to the suspicion of having been slightly touched up by a romancer before being placed before the public eye; but as it has a practical business air which should be emulated by all station agents, we give it in full as a model. It is taken from an exchange, which describes it as a literal copy of a letter received by the general freight agent of the Toledo, St. Louis & Kansas City recently:

Mr. W. S. Weed, Esq.  
G. F. A. Toledo  
Ohio

Cind Sir

Your Rates on H H Good's Just rec'd at 12-48 p m To day To Hilliard Pa and will say to you that I don't know whether The goods will be shipped at all or not Now, the Party that we're waiting to ship aug 22nd his Brother shot him yesterday But he was not dead yet This morning at day light but I think he will die, he is shot in the mouth—

Yours Truly

— Ind. 8-30-88

#### Courtesies to the Press.

We have been repeatedly asked why we did not open on the G. & S. Railroad for its slow time, miserable old cars, rough road, high rates, and generally incompetent service. It is because we have been expecting an annual pass from the road. We applied for it three months ago, but have heard nothing as yet. We are nearing the limit. If that pass is not here inside of a fortnight, we shall sound our bugle in a manner to make the officials of the road wish they had never been born.—Arizona Kicker.

#### Mistaken Identity.

A scene in Chicago:  
A.—Who was that man you bowed to coming out of the hotel?  
B.—A person who stands very high in railway circles.  
A.—Judge Cooley, of the Inter-state Commerce Commission?  
B.—Bless you, no; a bigger man than Cooley.  
A.—Who is it, pray?  
B.—A ticket scalper.

#### New Station at Greycourt.

The Erie's new station at Greycourt, N. Y., is rapidly nearing completion. Its length is 118 ft. 2 in., including the covered way; width, 23 ft. 8 in. The outside is finished with white pine, the inside with Georgia pine. At the east end is a separate building, which will be used for a telegraph and trainmen's room. On the west a separate building will be used as a baggage and express room. Covered platforms connect both of these buildings with the main station. The general waiting room is 20 x 30; ladies' room, 9 x 22; men's toilet room, 9.7 x 10; way bill office, 10.2 x 13.2. The west end of the general waiting room is finished off in ornamental brick with a terra cotta fire-place. The inside is finished in Georgia pine. The roof will be slated. Steam heat will warm the rooms.

#### Railroad Law in Iowa.

Judge Brewer, of the United States Circuit Court, has just filed at Des Moines an important decision bearing on the Iowa Railroad Law and the construction to be put on legislation of this kind. Certain merchants brought suits in the District Court against the Rock Island and other roads for alleged violation of the state railroad law. The roads at once took the papers to the United States Circuit Court, alleging that it was the proper court of jurisdiction. Justice Brewer remands the cases to the court from which they were taken. The gist of his decision is contained in the following extract:

"In whatever form the state pursues her rights to punish the offense against her sovereignty, every step of the proceeding tends to one end, the compelling the offender to pay a pecuniary fine by way of punishment for the offense. Though this case is not precisely in point, yet the thought underlying it, the principle which controlled the decision, is applicable here, and it must be adjudged that, in the opinion of the Supreme Court of the United States, the ultimate authority on questions of this kind, an action to enforce a penalty, whatever may be its form, is one of criminal nature (and that therefore the state has jurisdiction). I have given the subject long and patient examination in view of the vast interests and the importance of the question, and against my first impressions I have been forced to the conclusions I have thus announced.

#### TECHNICAL.

##### Peters' Electric Signal.

Mr. Christian Peters, of Danville, Ill., has invented a rail road signal which consists of a vertical cylinder, within which is contained a lamp. The cylinder has two or more openings around the circumference, which are furnished with colored glass to correspond to the character of the signal desired, and is itself connected to the armature of an electro-magnet by means of a rack and pinion in such a way that when no current passes in the coils of the magnet a white signal is shown, but when a current circulates in the coils the movement of the armature rotates the cylinder and causes a red target (a portion of the surface of the cylinder) by day and a red light

### NEW CONSTRUCTION, JANUARY 1 TO DECEMBER 31, 1888—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction or projected for next season.		
	From	To	Miles	From	To	Miles
Eutawville.	Vances, S. C.	Santee River.	2.5	Santee River	Sumter.	33
Elgin, Joliet & Eastern.	Eola, Ill.	Spalding, Ill.	16.7			
"	Walker, Ill.	Coster, Ill.	32			
"	Joliet, Ill.	McCool, Ind.	54			
Elgin, Pitt. & Havelock.	Saginaw C. belt line		5	Havelock, N. B.	Kuth's Mills.	14
Farmville & Powhattan.	Bay City Branch.		2.11	Jennings' Cross, Va.	Farmville, Va.	64
Flint & Pere Marquette.	Coleman exten.		3.55			
"	Wayco, Fla.	Harpers, Fla.	2			
Florida Midland.	Longwood.	Eastward.	2	Harpers, Fla.	Kissimmee, Fla.	14
Forest City & Southeastern.				Forest City, D. T.	Gettysburg, D. T.	10
Forest City & Watertown.	Ft. Smith, Ark.	South.	5	Forest City, D. T.	Bowdle, D. T.	75
Ft. Smith, Paris & Dard.	Fresno, Cal.	Belmont Colony	0.5	End of track.	Arkadelphia.	75
Fresno, B. & Yosemite.	Columbus, Miss.	Westward.	39	Belmont Colony	Eisen Vineyard	7
Georgia Pacific.	Woodland, Ala.	Bessemer, Ala.	19	Columbus	Johns Valley, Miss.	140
"	Bessemer Belt		1.5	Valdosta, Ga.	Palatka, Fla.	138
Georgia Southern & Fla.	Near Avondale, Ga.	Vandosta, Ga.	140	West Upton, Mass.	Milford, Mass.	8
Grafton & Upton.	Grafton C'tre, Mass.	West Upton.	5			
Grand Trunk.	Peterborough, Ont.	Lanefield Junction.	1.5			
"	Peterborough, Ont.	Chemung Lake.	8			
Middle Div.	Ft. Covington.	Massena Sps., N. Y.	21.5			
United States & Canada.	Melochville, Ont.	Valleyfield, Ont.	10			
Beauharnois Junction.	Green Pond, Waltham, & C. R. V.	Waltham, S. C.	35			
Green Pond, Waltham, & C. R. V.	Baillinger, Tex.	San Angelo, Tex.	35			
Gulf, Colorado & Santa Fe.	Hancock & Calumet.	Southward.	4			
Hancock & Calumet.	Hawesville & Pellsville M.		4	Hawesville	Pellsville, Ky.	18
Hawesville & Pellsville M.				Beaver Dam		27
Hereford.	Inter. line.	Cookshire, Que.	25			
Housatonic.						
New Haven & Derby.	Botsford, Conn.	Derby, Conn.	13.5			
Huntsville Belt & M. S.	Huntsville, Ala.	Marlewood, Ala.	5			
Illwaco & Shoal Water Bay.	Ilwaco, W. T.	Long Beach, W. T.	4	Long Beach	Shoal Water Bay.	12
Illinois Central.	Perry, Ill.	C. B. & Q. Crossing.	68			
"	Argyle, Wis.	Dodgeville, Wis.	29			
Chicago, Madison & No.	Madison, Wis.		2			
"	Oxford, N. S.	Pictou, N. S.	26			
Intercolonial.						
Isbell & Iron Mountain.	Arlington, Fla.	Burnside Beach, Fla.	13	Isbell, Ala.	Brown ore beds.	6
Jacksonville, Mayport & Pablo.				Howard Junc.	Johnsburg, Pa.	42.5
Kanawha & Ohio.						
Charleston & Ganley.	R. Transfer, W. Va.	Campbell's Ck., W. V.	2.5	Campbell's Ck.	Walden, Va.	2
Kanona & Prattsburg.	El Paso, Tex.	Northward.	10	Kanona, N. Y.	Prattsburg, N. Y.	12
Kan. City, El Paso & Mexican.				End of track.	White Oaks, N. M.	150
Kan. City, Ft. Scott & Mem.						
Current River.	Birch Tree.	Grandia, Mo.	81			
Kan. City, Ft. Smith & South.	Neosho, Mo.	Joplin, Mo.	25	Neosho.	South.	9
Kan. City, Ind. & Park.	Kansas City, Mo.	Bessemer, Ala.	11			
Kansas City, Mem. & Birm.	Eastly, Ala.	Coal Mines.	2			
Kansas City & Pacific.	Parkeville.	Paola, Kan.	32			
Kansas City & Southern.	Vance, Kan.	Kansas City, Mo.	48			
Kansas City, Wyandotte & N. W.	Axtell, Kans.	Summerfield.	12			
	N. Leavenworth.	Ft. Leavenworth.	2			
Kentucky Midland.						
Kentucky Union.	Knoxville, Tenn.	North.	11	Frankfort, Ky.	Union Junc., Ky.	27
Knox, Cum. Gap & Louisville.	Knoxville, Tenn.	Hornellsville, N. Y.	10	Frankfort, Ky.	Jackson.	51
Lackawanna & Pittsburgh.	Lake Erie & Western.	Farmdale, Ill.	15.43	End of track.	Cumberland Gap.	52
Lake Erie & Western.	Leamington, Ont.	Comber.	15			
Leamington & St. Clair.	Wind Gap, Pa.	Saylorsville, Pa.	5			
Lehigh & Lackawanna.	Fairview, Pa.	Pittston, Pa.	17.2			
Lehigh Valley.	Mahanoy, Pa.	Barry.	2.5			
Roselle & So. Plainfield.	Roselle, N. J.	So. Plainfield, N. J.	3			
Loyalsock.	Quarries.	Rockland, Me.	5			
Lime Rock.						
Long Island.						
Los Angeles & Pacific.	Los Angeles, Cal.	Santa Monica.	13	Locust Valley.	Oyster Bay, N. Y.	4
		Prospect Park.	4.5			
Los Angeles & Ocean.	Los Angeles.	San Pedro, Cal.	24			
Louisiana North & South.	Motinox Switch.	Honolulu, La.	6			
Louisville & Nashville.	Harborsville.	Pinetown, Ky.	17			
Birmingham Mineral.	Boyles, Ala.	Trussville, Ala.	65			
	Village Sps., Ala.	Chepultepec, Ala.	18			
Nashv. Florence & Sheffield.	Iron City, Tenn.	Florence, Ala.	19.5			
Louisville, New Orleans & Tex.	Lamont, Miss.	Rosedale, Miss.	25.5			
Louisville, St. Louis & Texas.	West Point, Ky.	Henderson, Ky.	122			
Louisville Southern.	Louisville, Ky.	Burgin, Ky.	83	Lawrenceburg.	Lexington, Ky.	25
Versailles & Midway.	Midway, Ky.	Rustburg, Ky.	10			
Lynchburg & Durham.	Lynchburg, Va.	Rustburg, Va.	13			
Manistee & Northeastern.	Manistee, Mich.	Onekama, Mich.	13			
Manitoba & Northwestern.	Langenb'g, N. W. T.	Saltcoats, N. W. T.	25.26			
Marquette, Col. & Northern.	Big Run, O.	Stewart, O.	5			
Meriden, Waterbury & Conn. R.	Waterbury, Conn.	East.	4			
Mexican Central.						
Guadalajara Die.	La Riedad.	Guadalajara.	95			
San Luis Potosi Die.	Agua Calientes.	Salinas.	59.6	Salinas.	San Luis Potosi.	121.1
Tampico Die.	El Salto.	Cardenas.	4			
Mexican National.	Cameros, Mex.	San Miguel.	326			
Michigan Central.	In Detroit.		326			
	Niagara, Ont.	Assembly Grounds.	1			
	Oil Springs, Ont.	Edy's Mills, Ont.	2.5			
	Freight Branches.		56			
Midland (Indiana).						
Milwaukee, Lake Shore & West.	Rhineland, Wis.	Flambeau, Wis.	27.5	Ladoga, Ind.	Brown's Valley.	10
	Hurley.	Harrison, Wis.	13.1	Flambeau.	Hurley, Wis.	41
Wisconsin River Branch.						
Pence Branch.	Extended.		2.6			
Ontonagon Branch.	Int. Lumb. Co. Mill.		1.7			
Minn., St. P. & Sault Ste. Marie.	Cardigan Minn.	Minn Soo Line Junc.	5.5			
Minnesota & Dakota.						
Minnesota Northern.	Branch Spur.	Twin Lakes, Minn.	3			
Mississippi River & Bonne Terre.	Bonne Terre, Mo.	North.	3			
Missouri, Kansas & Texas.	Dallas, Tex.	Lancaster, Tex.	16			
Missouri Pacific.	Talmadge, Neb.	Crete, Neb.	38			
	Boonville, Mo.	Lexington.	77			
Kansas & Arkansas Valley.	Van Buren, Ark.	Wagoner, I. T.	84			
Mobile & Birmingham.	Sprattly, Ala.	Alkreson, Ala.	24			
Mobile & Spring Hill.	Mobile, Ala.	Spring Hill, Ala.	5.5			
Napanea, Tamworth & Quebec.						
Sarnia, Port Huron & Detroit.						
Nashville & Knoxville.	Lebanon, Tenn.	Hickman, Tenn.	31			
	Hickman, Tenn.	Carthage, Tenn.	8			
Nashville & Tellico.	Athens, Tenn.	Tellico Plains.	24			
N. Y., Mahoning & West.	Ottawa, O.	Findlay, O.	23.5			
	Glundorf.		13			
New York & Northern.	Van Courtlandt.	Yonkers, N. Y.	3			
N. Y., Ontario & Western.						
Wharton Valley.	New Berlin, N. Y.	Edmeston, N. Y.	7			
New York, Penn. & Ohio.						
New Castle & Shenan. Valley.	New Castle, Pa.	West Middlesex, Pa.	16.5			
Nevada & California.	Doyle, Cal.	North.	25			
Norfolk & Va. Beach.	Va. Beach.	Ocean Sh. Park, Va.	1			
Norfolk & Western.	Graham, Va.	Near Tazewell C. H.	20	Princess Anne C. H.	Elizabeth Pk.	25
	Elkhorn Ext.	On Flat Top, N. Va.	6.45	Tazewell.	Norton.	86
	Cripple Creek Ext.		1.00	Elkhorn Ext.		2.12
				Cripple Creek Ext.		1.54
				Graham, Va.	Fronton, W. Va.	106
Clinch Valley Die.						
Northern Central.	Canton, Balt.	Sparrows Pt. R. R.	98			
Union.	Phillipsburg, Mont.	Rumsey, Mont.	6.4	Mattawamkeag, Me.	Presque Isle, Me.	116
Northern Maine.	Nr. Victor, Mont.	Grantsdale, Mont.	10.6			
Northern Pacific.	Uniontown, W. T.	Genesee, Idaho.	15.6			
	Cheney, W. T.	Davenport, W. T.	41			
	Palmer.	Durham.	2.9			
	Orting.	L. Kiposin, "	8			
	Procter, "	Carbonado, "	5.5			
Northern Pacific & Manitoba.	Winnipeg, Man.	West Lynne.	65.7			
	Portage Junction.	West.	8			
				End of track.	Portage La Prairie.	200
Northwest & Florida.	Patsburg, Ala.	Luverne, Ala.	6			
Ohio & Northwestern.	Portsmouth, O.	Sciotoville, O.	5.5			
Ripley & Mill Creek Valley.	Ripley, O.	Jackson, C. H.	13			
Ohio Valley.						
	Lacooche, Fla.	St. Petersburg, Fla.	75	Princeton, Ky.	Hopkinsville, Ky.	31
Orange Belt.	Willow Creek, Ore.	Heppner, Ore.	45.5	Henderson, Ky.	Evansville, Ind.	10
Oregon Ry. & Nav. Co.	Texas Ferry, W. T.	La Crosse, W. T.	24.6			
	Selkirk, W. T.	East.	10			
	Winona, W. T.	East.	10	Selkirk, W. T.	Winona, W. T.	36
Washington & Idaho.	Farmington, W. T.	Rockford, W. T.	34			



## NEW CONSTRUCTION, JANUARY 1 TO DECEMBER 31, 1888—Continued.

NAME OF ROAD.	Track laid between Jan. 1 and Oct. 1.			Under construction or projected for next season.		
	From	To	Miles	From	To	Miles
Oregon Pacific.	Albany, Ore.	East.	20			
Oregon & Wash. Ter.	Wallula, W. T.	Walla Walla, W. T.	53			
"	Eureka Pt. J., W. T.	Estes, W. T.	20			
"	Hunt's Junc., W. T.	Fulton, Ore.	34			
"	Hillsdale, Ore.	Centerville, Ore.	14			
Orlando & Winter Park.	Orlando, Fla.	Winter Pk.	5	Winter Park.	Osceola.	2
Palmdale.	Seven Palms, Cal.	Palmdale, Cal.	6.5	Osceola.	Lake Jessup.	13
Paragould & Buffalo Island.	Paragould, Ark.	St. Francis R., Ark.	10	Paris, Tex.	Red River.	30
Paris, Choctaw & Little Rock.				Pensacola, Fla.	northward.	65
Pensacola & Memphis.						
Pennsylvania.						
Campbell & Clearfield.	La Jose, Pa.	Brubaker.	9.4			
"	St. Lee Bch.		5			
"	King's Run.		1.4			
"	Brubaker.		6.0			
Cincinnati & Richmond.	Red Bank Jct., O.	Hamilton, O.	24.47			
Penn. Pough. & Boston.				Slaton, Pa.	Campbell H.	91
Hudson Connecting.				Campbell H., N. Y.	Poughkeepsie.	29
Pough. & Boston.				Poughkeepsie, N. Y.	Silverman, N. Y.	25.5
Spring & Conn.				Simsbury, Conn.	Spring, Mass.	18.5
Phila., Wilm. & Baltimore.	Shellpot Br. (WIL).		5			
"	Wilmington.	Newcastle, Del.	6			
Pitts., Shen. & Lake Erie.	Greenville, Pa.	Amosa, Pa.	3.5	Amosa, Pa.	Conneaut, Pa.	50
Pomona & Elsinore.				Pomona, Cal.	Temescal Cañon.	20
Pontiac Pac. Junction.				Elsinore, Cal.	Pembroke, Ont.	14
Port Jervis, Monticello & N. Y.	Huguenot Junc.	Summitville, N. Y.	17.3	Black River.		
Portland & Vancouver.	East Portland.	Columbia R., Ore.	7			
Portland & Willamette V.	In Portland.		5			
"	Tulquart's Landing.	Willamette River.	1.5			
Raritan River.	Iron Works.	Oswego, Ore.	2.5	Washington.	New Brunswick, N. J.	13
Richmond & Danville.	South Amboy, N. J.	Washington, N. J.	7	Red Marble Gap.	Murphy, N. C.	27
Oxford & Clarksville.	Jarretts, N. C.	Red Marble G., N. C.	3			
"	Oxford, N. C.	Durham, N. C.	32	Winklesborough, N. C.	Mocksville, N. C.	27
"	Salem, N. C.	West.	8	Winston, N. C.	East.	26
Roanoke & Southern.				High Point, N. C.	Martinsville, Va.	60
Rochester & Glenhaven.	Rochester, N. Y.	Glenhaven.	3.5	Winston, N. C.	Irondequoit Bay.	1.5
Rockaway Valley.	Whitehouse, N. J.	N. Germantown, N. J.	4.2	Glenhaven.	Pottersville, N. J.	4
Rome & Decatur.	Farrill, Ala.	Turkeytown, Ala.	32	New Germantown.		
St. Augustine & South Beach.	St. Augustine.	South Beach, Fla.	3			
St. Catharines & Niagara Central.	Thorold, Ont.	St. Catharines, Ont.	5			
St. Cloud Sugar Belt.	Kissimmee.	Runnymede, Fla.	12			
St. John & Halifax.	E. Palatka, Fla.	Railston Junc.	4			
St. Louis, Alton & Springfield.	Newberne.	Alton, Ill.	13.4	Bates, Ill.	Springfield, Ill.	14
St. Louis, Alton & T. H.						
Chic., St. L. & Paducah.	Parker City, Ill.	Brooklyn, Ill.	38			
St. Louis, Arkans. & Texas.	Plano, Tex.	Fl. Worth, Tex.	44.7			
"	Near Corsicana.	Hillsboro, Tex.	20			
"	Altheimer.	Argenta, Ark.	42.8			
"	Lewisville, Ark.	Shreveport, La.	60.7			
"	Malden, Mo.	Della, Mo.	51.7			
"	Bluffton.	Anthony, Kan.	10.5	Springfield, Ill.	Eureka, Ill.	75
St. Louis & San Francisco.						
St. Paul & Duluth.	Thompson, Minn.	W. Duluth.	13.5			
St. P., Minn. & Man.	W. Duluth.	W. Superior, Wis.	4			
"	Willmar, Minn.	Sioux, Dak.	146.91			
"	Watertown, Dak.	Huron, Dak.	6.84			
"	Crookston, Minn.	Fosston, Minn.	14.69			
"	Churches, Dak.	St. John, Dak.	55.21			
"	Great Falls, Mont.		7.37			
"	At St. Cloud.		3.33			
Eastern Minnesota.	Hinckley, Minn.	W. Superior, Wis.	70	N. P. Bridge.	Union Dpt., Duluth	3
Montana Central.	Great Falls.	Sand Cowlee, Mont.	15.7	Sandstone Quarries.		2
"	Silver, Mont.	Marysville, Mont.	20			
"	Helena, Mont.	Fairground.	1.0			
"	Helena.	Butte, Mont.	73.3			
Salt Lake & Ft. Douglas.	Salt Lake City.	Ft. Douglas, Utah.	8			
San Antonio & A. Pass.	On Waco Branch.		56			
"	Skidmore, Tex.	Kieburg, Tex.	43			
"	Gregory, Tex.	Rockport, Tex.	20			
San Francisco & No. Pacific.						
Marin & Napa.	Ignacio, Cal.	Sears Point.	7.5			
Cloverdale & Ukiah.	Hopland, Cal.	Hopland, Cal.	14.5	Hopland.	Ukiah.	14
San Gabriel Valley.	Monrovia, Cal.	Westward.	10	Los Angeles, Cal.	Eastward.	6
Santa Ana, Fairview & Pacific.	Santa.	Fairview.	7.5	Fairview.	Newport Ldg.	4.5
Savannah, Fla. & Western.						
Thomasville, T. & M.	Thomasville, Ga.	Monticello, Fla.	24			
Seaboard Air Line.						
Carthage.	Carthage, N. C.	Cameron, N. C.	10			
Durham & North.	Durham, N. C.	Neuse River.	11.5	Neuse River.	R. Ledge Creek.	4
Roanoke & Tar River.	Henderson, N. C.	Big Ledge Creek.	28			
Geo., Car. & North.	Beverly, N. C.	Lewiston, N. C.	41			
Seattle, L. S. & Eastern.	Monroe, N. C.	Chester, S. C.	45			
"	Spokane Falls, W. T.	Wheatland, W. T.	45			
"	Kelsey Ldg., W. T.	Falls City, W. T.	27			
Sheffield & Birmingham.	Snodhish J., W. T.	Snodhish.	20			
Ship Island, Ripley & Ky.	Delmer, Ala.	Jasper, Ala.	36			
Silver Springs, Ocala & Gulf.	Cherry Creek, Miss.	Pontotoc, Miss.	8			
"	Dunnellan, Fla.	Gulf Junction.	1.42	Gulf Junc.	Nr. Bridgers, Fla.	15.37
"	Gulf Junction.	Hamosassa, Fla.	21.82	Ocala.	Palatka, Fla.	47.37
Silverton.	Burro Bridge, Col.	End of track.	9	Bridgers.	Pinnellos.	87.62
"				End of track.	Ironton, Col.	8
Somerset.				Silverton, Col.	Eureka, Col.	4
Southern Pacific.				Ironton, Col.	Ouray, Colo.	11
Stockton & Tulare.	North Anson, Me.	Placerville.	7.5	Embsen, Me.	Bingham, Me.	10
Santa Rosa & Carquinez.	Shingle Spring, Cal.	Toward Poso.	102			
Woodland, C. & C. L.	Fresno, Cal.	Toward Santa Rosa.	33			
West Side & Mendocino.	Napa Junc., Cal.	Rumsey, Cal.	24			
Pajaro & Santa Cruz.	Madison, Cal.	Fruto.	17			
San Pablo & Tulare.	Willows, Cal.	Monte Vista.	5			
San Joaquin & Yosemite.	Aptos.	South.	37.3			
Los Ang., L. B. & White.	Tracy, Cal.		21			
Long Beach.	End of track.	Whittier, Cal.	5.9			
South Florida.	Anahelm.	Tustin, Cal.	11.7			
South Norfolk.	Tampa, Fla.	Port Tampa, Fla.	9			
Staten Island Rpd. Tr.	Simcoe, Ont.	Port Rowan, Ont.	17			
"	Clifton.	New Dorp, S. I.	4			
Suffolk & Carolina.	Erastina.	Kill von Kull Bdge.	1.5			
Suwanee River.	Ryland, N. C.	Montrose Landing.	4			
Syracuse, Geneva & Corning.	On Hudson Branch.		3.25	Ellaville, Fla.	Lauraville, etc.	20
Tavares, Apopka & Gulf.	Penn Yan, N. Y.	Crookston, N. Y.	1	Watts Junc., Fla.	Oakland, Fla.	5
Tennessee Midland.				Jackson, Tenn.	Tennessee River.	48
Temiscouata.	Memphis.	Near Jackson, Tenn.	63	Tennessee R.	Nashville.	95
Texas, Sabine, V. & N. Western.	Jackson, Tenn.	East.	17	Edmundston, N. B.	Fort Kent, N. B.	20
Texas Pacific.	End of track.	Riviere du Loup, Q.	2			
"	Tatum, Tex.	Carthage, Tex.	16			
"	Straun, Tex.	Palo Pinto Mines.	4			
"	Plaquemine, La.	Indian Village, La.	7.5			
Tilton & Belmont.				Belmont, N. H.	Tilton.	1.14
Toledo, Ann Arbor & N. M.	Cadillac, Mich.	Springfield, Mich.	20	Springfield.	Frankfort, Mich.	41
Toledo, Columbus & Southern.	Findlay, O.	South Findlay, O.	6	Manistee R. Junc.	Manistee, Mich.	20
Toledo, Sag. & Mack.	Durand, Mich.	East Saginaw, Mich.	39	South Findlay.	Columbus.	74
Union Pacific.						
Lincoln & Colorado Div.	Waldo, Kan.	Colby, Kan.	131.8			
Denver, Marshall & Boulder.	Louisville, Col.	Lafayette, Colo.	3.28			
Upper Coos.	Stewart's n. N. H.	Canada Line.	2			
Valley (Ohio).	Mineral Point, O.	Coal Mine, O.	2			
Vancouver, Klickitat & Yak.	Vancouver, W. T.	East.	5			
Vincennes, Oak. & Owensboro.				Vincennes, Ind.	Owensboro, Ky.	70
Walden's Ridge.	Clinton, Tenn.	Oliver Spr's, Tenn.	15			
Warrior Coal Fields.				Meridian, Miss.	Balltown, Ala.	25.5
Warren & Farnsworth.				Balltown.	Starks, Fla.	16.5
Western of Florida.	Belmore, Fla.	Mt. Belmore.	1.5	Fairfield, Pa.	Blue Ridge.	11
Western Maryland.	Ortanna, Pa.	Fairfield, Pa.	4.5	Parsons.	Buchannon.	60
West Va. Central.	Thomas, W. Va.	Elk Garden.	7	Leadville.	Beverly.	28
Wheeling & Lake Erie.	Harrison, W. Va.			Lowerston, O.	Wheeling, W. Va.	43
Williamsport & Binghamton.				Williamsport, Pa.	Binghamton.	160
Williamstown & Del. River.	Glassboro.	Jefferson, N. J.	5.1	Mullica Hill, N. J.	Greenville.	1.5
Williamsv., Greenv. & N. E.	Williamsville.	Manning, Mo.	5.5	Greenville.	Miss. River.	30
Wilmington & Sea Coast.						
Winona & S. W.	Wilmington, N. C.	The Hammocks.	9.25			
Winterville & Pleasant Hill.	Winona, Minn.	Bear Creek, Minn.	21			
Wisconsin Central.	Winterville, Ga.	End of track.	6			
"	Marshfield.	End of track.	5			
Zanesville & Ohio River.	Coolidge Junc.	Cook Station.	5.78			
Zealand Valley.	Waterford, O.	Harmar, O.	22.3			
"	End of track.	Pemigewasset R.	1			

by night to be displayed to an approaching train. When the current ceases the armature is withdrawn from the magnet by a spring, and the rotation of the cylinder again shows the white side of the signal. As a special or station signal this is intended to be placed on a post at any desired distance from the point of danger, and to be operated in the circuit of a battery connected by wires to the magnet in the signal. The inventor designs to light the signal by electricity, but any other kind of lamp can be used. This device is simple and cheap, but beyond this it has nothing to recommend it over a great many other inventions designed to accomplish the same end, and it has manifest disadvantages for outdoor use.

## The Worsdell-Borries Compound Locomotive.

Mr. von Borries contributes to the *Organ für die Fortschritte des Eisenbahnwesens* several interesting tables, giving the number of compound locomotives of the Worsdell-Borries type in operation in different countries up to the date of compilation, Nov. 1, 1888. According to these there were in Germany 147 and in all other countries 163, making a total of 310. With regard to the cost of running and repairing compound locomotives he cites the records of 10 ordinary engines and two compounds since the autumn of 1883, which show the cost for the compounds to be the lower by about 7 per cent. All 12 engines were doing the same kind and amount of work on the same division, hauling freight.

## The Westinghouse Brake.

The Westinghouse Air Brake Co. is sending out the following circular to roads using its brake. Our attention has been called to the fact that the application of our brakes to freight cars has, in a number of instances, been done in such a manner as to practically nullify the benefit that can rightfully be expected from their use in actual service. It is especially desirable that the excellence of your brake apparatus be unquestioned, and the highest order of results be obtained by your company by its proper application upon your engines and cars. We would therefore request that, when favored with orders for brakes, you provide us with the necessary plans of the structure to which they are to be attached, in order that we may prepare and furnish you drawings showing the adaptation of the brakes thereto, and a brake rigging that will produce the best results with a minimum of cost for future maintenance. In so doing, any difficulty heretofore experienced from absence of proper information may be entirely avoided, and an apparatus recommended, that long experience in brake matters enables us to confidently assert, will give the best satisfaction. We will be pleased to also provide, without charge, a competent representative to co-operate with your officials in the education of your employees in matters pertaining to brakes, and to superintend their attachment wherever applied. In this connection we would suggest the insertion in your engine or car contracts, when our brakes are specified, that they should be applied in such vehicles in accordance with plans provided by this company.

## Locomotive Speed Indicator.

German inventors at present seem to be hard at work on different designs of locomotive speed indicators, one of the latest devices of this class being known as the Brüggemann indicator, put on the market by a Breslau firm, Messrs. P. Suckow & Co. In some respects its arrangement is familiar, depending, as it does, for its proper function upon the behavior of a quantity of mercury in a revolving chamber. This is of parabolic vertical section, and has motion imparted to it by bevel gearing from one of the moving parts of the engine. Into it projects a part, also of parabolic section, bored out to receive a light iron float communicating through a rod with an index hand and dial plate. This part is fitted so as to leave an annular space between its sides and the walls of the chamber already mentioned. The mercury moves into this space as soon as motion is imparted to the apparatus, following the parabolic walls of the chamber; the central part of the surface of the mercury is correspondingly depressed, causing the float to descend, and registering its fluctuations on the dial. The latter indicates revolutions per minute, and the whole apparatus is said to be very sensitive to variations of speed. It has been in use, experimentally, on six different railroads with satisfactory results, and is now to be extensively manufactured.

## Merchants' Bridge, St. Louis.

Ground was broken for the foundation work of this bridge on the 16th inst. It is currently said that the Union Bridge Co. has the contract for the piers and superstructure at the round figure of \$1,250,000. This, however, is not yet confirmed. Anderson & Barr have the contract for the caisson work.

## Steam Heating in Minnesota.

The Railroad and Warehouse Commissioners of Minnesota have, as is known, taken pains to get the opinions of railroad officers as to the efficiency of the various existing methods of heating trains by steam from the locomotive. They have now issued a report on heating and lighting passenger cars, with special reference to safety from accident by fire. The Commission is of opinion that the time is not yet come when it is safe to rely altogether upon steam from the locomotive for car heating in the extreme Northwestern states. The opinion is expressed, however, that there is no reason for longer tolerating common car stoves, and the passage of a bill is recommended provided that no car running in passenger service shall be heated by any furnace or heater unless it is approved by the Railroad and Warehouse Commission, and providing that in no event shall a common stove be allowed in passenger service. The term "common stove" is to include all stoves that heat by direct radiation. The commissioners have not found it expedient to take any action with regard to lighting trains.

## Trials of the Westinghouse Buffer.

We have received the following particulars of tests of the Westinghouse friction buffer made Wednesday, Jan. 10, at the Pennsylvania shops at Altoona. Two Pennsylvania Railroad gondola cars were fitted with the buffer. The two cars were set on a piece of straight track and the brakes on one firmly set; an engine hauled the other back and then gave it a shot down the track, so that it came into collision with the standing car. Fourteen such tests were made. In the first the moving car had a speed of about 5 miles per hour; in the successive tests, up to and including the eleventh, the speed was gradually increased, until, in the eleventh test, it reached 25 miles per hour. In the twelfth test, at a speed of 25 miles per hour, some of the blocking back of one of the buffers was smashed by the concussion, and one of the car trucks broke loose from its fastenings, and stripped the body bolster. On the fourteenth test a speed of 30 miles per hour was reached, with the result that one centre sill on the moving car was cracked, near the body bolster, and both centre sills of the fixed car were cracked at the same place; the drawhead of the fixed car was also broken in the shank; the bolsters under both cars were partially stripped from their positions. The buffers however remained uninjured.





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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The trunk line presidents held a meeting Tuesday for the purpose of extending the operations of the agreement of Jan. 10. The question of modifying the trunk line agreement itself, in case that should seem necessary, was left for the future. Of the resolutions actually adopted, the most important was the one which commits the roads to the policy of reporting one another's violations of the law to the Interstate Commerce Commission. The resolution that "the principle of arbitration, if necessary, be more distinctly reaffirmed" seems to be a little tinged with sarcasm. There are cases where a very little exercise of the practice of arbitration is much more necessary than a great deal of reaffirmation of the principle.

The Illinois Central has reduced its semi-annual dividend from  $3\frac{1}{4}$  to  $2\frac{1}{4}$  per cent. Detailed figures of expenses are not published; but some general statements of the grounds for this action are presented in the form of a letter from the general manager to the president. The result is partly attributed to bad crops, partly to increased requirements upon motive power, and partly to the operation of the Interstate Commerce act. So large a reduction was unexpected, and has been somewhat criticised for its suddenness; but we are inclined to believe that it was justified. On general grounds, we are in favor of the policy by which a company divides what it has earned, rather than of that by which it arranges its accounts to make the dividend rate as unvarying as possible. So far as the present result is due to the operations of the Interstate Commerce act, the reasons for reduction of dividend are all the stronger. If a company says that the law hurts it, but goes on paying the same dividend, nobody will believe what it says. Investors, seeing the good apparent profit, will be ready to let their money be used for parallel lines; Congressmen will laugh at a demand for any change in the law. But if dividends be at once reduced to meet the reduction in real profits, it will be a guarantee that the statements are well founded. It will discourage the investment of new capital in that section of the country. The persons who are thus deprived of railroad facilities will see that any reduction in rates has been purchased at a dear price, and will be not only ready but anxious to see the objectionable features of the law modified. In this way, and in this way only, can railroads hope to protect themselves. If matters are as bad as they seem, the sooner the public feels it the better. In order that the public may feel it, it seems to be a painful necessity that the stockholders should feel it first.

In reading the discussion at the last meeting of the Western Railway Club, one can but be impressed with the importance of the information there offered, relative to the friction of the various kinds of journal bearings, in all considerations of the subject of train

resistance. This is shown by a remark made by Mr. Rhodes, which in substance was that, at the time of the Burlington brake tests, it was determined that one train had far less resistance, per car, with the same load, than another train fitted with different kind of bearings. This difference in the comparative frictional resistance amounts to more than 60 per cent. The same difference was noticeable in the results of experiments made upon the oil testing machines. This marked difference in friction between different kinds of bearings was further substantiated by the remarks and opinions of various members who had experimented in that line. The evidence on this point was so corroborative that, as a conclusion, one might say that the differences in the quality of the materials of the bearings, the hardness of the surface, and the efficiency of the lubrication may give rise to variations in train resistance, on level tangents, without heavy wind resistances, which will affect the total resistance of the train as much as 50 per cent. The bearing which this conclusion would have upon train resistance is very easily seen. It is this, that no satisfactory comparison of data obtained from train resistance tests can be made unless we at the same time know the differences in the journal bearings, their design and composition, efficiency of lubrication, the character of the oil and its mode of application; and, furthermore, the diameter of the wheels, in proportion to the diameter of the journals, which are under the car. Probably no more interesting topic, or one discussed more at length, has been brought before the Western Railway Club during the past year, and it is doubtful if the discussion of that subject is, as yet, finished. Several of the members intimated that they had further information to bring forward at a future meeting. There are other conclusions in regard to the effect of journal friction upon train resistance to which we desire to call attention in a subsequent issue. Information which bears directly on the subject has not yet been arranged, and without it the argument would not be sufficiently conclusive.

The trial of electric lighting on special trains has proved, if nothing more, that the method is possible, and while expensive, not only in the cost of running but in maintenance, in its present form, it is yet so satisfactory that continued use is promised for it. The Pullman Company thus far sees no reason for discarding this system of lighting, and it has had more experience with it than any one else. The present mode of arrangement and operation of the apparatus is about as follows: In the front end of the front baggage car, in one corner is placed a small engine and dynamo. The engine is what is known as the "tri-cylinder" type. It has three cylinders arranged at an angle of 120 deg. to each other around the same shaft. Although not a rotary engine, in the strictest sense of the word, yet it operates in a similar manner. This engine is about ten horse-power and the dynamo is about the same. The engine runs all the time the locomotive is connected to the car, during the day as well as the night. During the daylight it stores energy in storage batteries of one of the ordinary forms. This energy is converted into electricity at night when the lights are used. To assist the storage battery, the engine is operated while the batteries are being used. This continued service renders the engine a little more liable to derangements. It is stated, at the time the Golden Gate Special left Chicago, that it required a 36 hours' action of the engine to store enough current in the storage batteries to run the lights for eight hours. The waste of horsepower in the engine is enormous compared with the amount of candle power given out by the lights. The amount of steam required from the locomotive to produce the light is about the same as that required for steam heating a railroad train of the same length. No special connections or electrical apparatus is required in the electric lighting of trains. It is accomplished in the same manner as in many stationary plants of the same size. Although, at the present time, electric lighting of trains is very expensive and is maintained principally for the purpose of advertising, yet beneath all this there is a willingness and a semi-determination on the part of the managers of the palace car lines using electric lights to perfect such systems as fast as it is possible to do so with entire satisfaction. Without extended experiments we can scarcely hope to develop a good system of electric lighting for railroad service. Such experiments are rather expensive, and it is only by the co-operation of liberal-minded managers that anything like a perfect system can be expected in a reasonable time. The

Pullman Co. has great confidence in the success of electric lighting, and therefore, in spite of the annoyance and expense of the present system, expresses a determination to continue to use it, expecting that something better will result in the near future from the extended experience now being obtained. At present electric lights are being used on nearly all of the Pullman special trains running out of Chicago, besides those in use in lines further West and South. A train of special Pullman cars, lighted by electricity, heated by steam, with all modern improvements, will soon make the trip from New York to San Francisco via New Orleans and the city of Mexico, returning through the North, so that a traveler can start from New York, and while surrounded by all the comforts of a hotel, can make a complete circuit of the United States under the light of the incandescent electric lamp.

The increasing speed of trains is bringing up anew the old question of counterbalancing locomotives. This is not only the case in the United States, but we have lately heard of a case in Australia, in which the permanent way was severely damaged by the passage, at high speed, of a locomotive which had not been properly balanced. We recorded in our issue of Aug. 3 a case on one of the Western roads, where the rails were bent  $\frac{1}{8}$  in. to  $\frac{1}{4}$  in. by the severe pounding of an engine supposed to be insufficiently counterbalanced. Some of the counterbalance weight was removed and no further trouble of the kind appears to have been had with that locomotive. Some master mechanics are now recommending the removal of all weights inserted for the purpose of counterbalancing the reciprocating parts. This problem contains one of the difficulties in the way of running at much higher speeds than those at which we now travel. Through trains in the West, not only passenger, but freight, are now moving at very high speeds. We have knowledge of one passenger train which has been averaging 58 miles per hour for a run of three hours, including several stops. An estimate shows that this train must have often traveled 70 miles per hour. At this speed of 70 miles per hour the centrifugal force of the extra counterbalance is enormous, and it is a question if greater care must not be taken to avoid excess of balance if such speeds are to become common.

#### How to Get Good Rails.

We published last week the opinions of a number of chief engineers of railroads on the matter of specifications and tests for rails, and this week we give the expressions on the same subject of a number of rail makers. There are two points on which there is substantial agreement among the various well informed men who have taken part in this discussion. One is that notwithstanding the increase in weight of rails, possibly to some extent as a result of it, rails made now do not wear as well as those made a dozen years ago. The other point is that chemical specifications are of little value. These conclusions, however, are not new, but have for some time been common talk. There is no agreement as to what should constitute a proper system of physical tests or of inspection, nor is there any common opinion as to whether or not it is desirable to buy on a guarantee.

The elaborate specifications of Capt. Hunt, which serve as a text for most of the comments of the makers, would secure well finished rails, and would insure rational treatment in the mill. They would give a more or less complete mill history of the rail, also, and would make the buyer tolerably sure of getting certain physical properties; but the tests are far from providing that prescription for which every one is looking, which will enable one to know in advance that he is getting a durable rail. It will be seen that the makers look on the specifications, tests, and guarantee as prescribing too much and too little. That is, they give the buyer's inspector pretty large powers, but do not provide that when his requirements are satisfied the transaction shall be closed and the maker's responsibility ended. They tell the maker how he shall make the rail and then require him to guarantee its life. Naturally the manufacturers do not altogether favor an arrangement which on the face of it is one-sided and one of them states the most plausible objection to Capt. Hunt's specifications when he says that they prescribe modes of manufacture rather than qualities of product.

This we take it is the chief objection that the railroad engineer will find to them. After all, he wants to get a good rail rather than to know how it is made. As Mr. Hannaford says, it is for the engineer to look at net results, and let the doctor (the maker) effect the cure or suffer for his incompetency. Un-



doubtedly it is for the interest of all concerned that the railroad engineer should have a thorough knowledge of the material and the manipulation of his rails that he may not only judge intelligently of the competence of the maker, but may help to the solution of one of the most complicated of technical problems; but it is questionable if he can ever prescribe strictly how or of what rails should be made. At any rate this is practically the position which most engineers now take.

The Pennsylvania prescribes a maximum and minimum limit of carbon, requires specimens for test and analysis, and provides for a record of each charge and of the date and place of manufacture. After each rail goes into the track its history is known. The chief engineer finds that "the rails now furnished to the company improve in wearing quality and strength." We venture to say that this result has come about more from the knowledge obtained by the service record of the rails than from the preliminary specifications and tests. The relative value of the product of different mills has become experimentally known, as has also the relative value of the product of each mill at different times. The experience so got has doubtless been profitable to the buyers and to the makers. The Lehigh Valley makes no specifications, except as to amount of carbon. The Erie, the Chicago, Milwaukee & St. Paul, the Atchison, and many other great companies buy on a guarantee; while of all the companies reporting, only the New York Central has adopted specifications so complete and rigorous as those of Captain Hunt.

So far the result of the inquiry is chiefly negative. It shows that no one has yet been able to frame specifications on which rails may be made and bought with confidence as to the results. It indicates that the best that can be done is to inspect carefully for mechanical defects, to keep a full record of the performance of rails and to hold the makers to strict responsibility. If the engineers could control the placing of orders this might be sufficient. The reputation and guarantee of the mill would give the railroad companies a fair assurance of getting good rails, and would have a commercial value to the makers. But whenever it is merely a question of getting so many tons of rails for the least possible sum the most ingenious specifications and tests will be but little protection. The most scrupulous maker must stand in the market with the least scrupulous, and as Mr. Whittemore lately said it will inevitably be the aim of the mills to limit their output only by the amount of metal that can be squirted through their rolls in the shortest possible time and have the product accepted.

There are, however, two positive lessons which seem pretty clear from the correspondence on this subject of rails. We said that the recent unsatisfactory wear of rails was in spite of the increase in weight, and possibly to some extent as a result of it. The conviction has spread fast in the last two or three years that in the modern heavy sections the head has been made disproportionately large. It has consequently been rolled too hot, and has not been sufficiently worked down in passing through the rolls. Mr. Hunt, in the paper to which we have before referred, takes this position; Mr. Hawks has long held it, and various makers have lately adopted it. The tendency in recent sections to a thinner head is very noticeable, showing that the idea is growing among engineers that it is of less importance to have a good deal of metal to wear down than to have a more compact and homogeneous head. Along with this thinner head there is an increase in the radius of the crown which must be gratifying to Mr. Whittemore. The Sandberg standard has long been 6 in., and until very lately 10 in. has been in this country the longest radius used to any extent. Of the more recent heavy sections we find the following radii: Lake Shore, 71 lbs., 11 in. radius; Union Pacific, 75 lbs., Michigan Central, 80 lbs., Philadelphia & Reading 90 lbs., New York Central 80 lbs., Mattes proposed 83 lbs. and Sayre's heavy section all have 12 in. radius, and the New York, New Haven & Hartford 72-lb. rail has a crown radius of 15 in. There is a long way between 12 inches and infinity, but these recent examples show, we think, progress towards Mr. Whittemore's idea of a flat head.

The second lesson is that with increase of weight there may with safety be, and for wear there should be, an increase of carbon. Mr. Sayre has raised his carbon specification to 0.50 and 0.55, and is considering the propriety of making it 0.60. Mr. Hannaford recommends 0.50 to 0.55 carbon for 75 and 80-lb. rails. The New York Central specifies 0.50 to 0.60 for 80 lb. rails. The mechanical engineer

of one of the best rail mills in the country, of which the product stands always at the head of the market, lately said that he would recommend 0.80 carbon for heavy sections if he thought he could get the roads to use it. Of course, with light sections, carbon will be and should be kept down, but we believe that one of the next important economies in rails will be heavy sections and higher percentages of carbon.

#### The Defense of Existing Car-load Rates.

The brief of the railroads in the car-load rate cases was prepared largely, if not wholly, by Albert Fink himself. Under these circumstances it is a positive addition to our store of facts regarding traffic economy.

It appears that at the docks where miscellaneous freight was handled, the average cost per ton for handling and loading was from 58 to 62 cents, while the average cost at a car-load freight dock was only 16 cents per ton. It also appears from the testimony that the cost of unloading miscellaneous freight averaged about 23 cents per ton, while the average for car-load freight was only 9 cents. The aggregate terminal expenses per ton of miscellaneous freight were thus more than three times those of car-load freight, while the absolute difference in expense was from 2.8 to 3 cents per hundred pounds.

The exhibits also show that the average load of miscellaneous freight in a single car was only about five tons, while the average of car-load shipments was about fifteen tons. But without going to this extreme, Mr. Fink shows that, on the assumption of 5½ tons miscellaneous car loads and 14½ ton car-load shipments, a train whose gross weight is 637½ tons will carry 362½ tons paying freight in the latter case, and only 212.3 tons in the former. This difference would make the cost of haul per ton of miscellaneous freight 70.7 per cent. greater than that for car-load freight. Without laying too great weight on these figures, Mr. Fink feels fully warranted in the conclusion that the excess cost of hauling is between 47 and 100 per cent. over that of car-load freight, to which is to be added the difference in terminal expense already alluded to, as well as the special expense of transfers *en route* and of local stops for distribution. He has little difficulty in showing that the differences in rates lie within the limits of the difference in cost as thus presented.

But the case is by no means exhausted. The complainants placed great reliance on two separate points, which are more or less independent of the general answer thus far given. Mr. Greene, in his brief, lays great stress on the fact that rates are not primarily based upon cost of service, but upon value of service; and that the low car-load rates to interior points produce a relative scale of prices, at New York and at interior distributing centres, which render direct shipments at parcels rates impossible. The retailer at interior points is thus forced to buy of the interior jobber rather than from the seaboard direct. The interior jobber is given a monopoly which will enable him to charge high prices and make high profits, while his competitor at the seaboard will suffer. But it is obvious that goods cannot be brought from New York to the local retailer in the less economical fashion at prices dictated by the conditions of the more economical one. If we level at all, we must level up. It is difficult to see how the local dealer could receive anything but harm from such a process, when the difference in cost between the two methods is so great, as is shown by Mr. Fink. As we pointed out in a previous article, it is bad public economy to keep business in the more costly channel by refusing to give due preference to the cheaper method.

It is also urged by the complainants that "the comparatively light loads of miscellaneous freight in cars loaded at New York are due to the fact, as alleged, that there are a great many cars which would have to be returned empty from New York; that, therefore, no motive exists for the loading of cars more fully with miscellaneous freight, as it made no difference in the cost of transportation whether the cars were fully loaded or not."

Mr. Fink's reply is as follows:

"Supposing that there were at New York an abundance of cars returning empty west-bound, the fact is lost sight of that the present classification does not apply alone to west-bound traffic from New York and other seaboard cities, as did the special classification on west-bound traffic in use prior to April 1, 1887, but applies to the traffic within the whole territory east of the Mississippi and north of the Ohio rivers, on east-bound and west-bound, north-bound and south-bound, from and to any of some 10,000 stations, on 47,000 miles of railroad. The same condition as is alleged to exist at New York regarding a surplus of empty cars cannot and does not

exist at all points throughout the territory in which the new classification is now in use.

"While there is a preponderance of east-bound over west-bound traffic on the Trunk Lines, taking the average of a whole year's operation, this condition does not prevail on all the roads upon which the classification is in use, and does not even prevail on the Trunk Lines during all periods of the year. On some roads west of the Trunk Lines the preponderance of the tonnage is in a westerly direction. These conditions are different on different roads, and varying at different seasons of the year. It would be impossible to establish a uniform and permanent classification based upon the empty car theory."

All this is valuable, apart from its bearing on the case immediately in hand. It illustrates the price which shippers have to pay for anything like uniform classification. Under the old system of special rates, the special circumstances of each locality or each individual could be fully taken into account. The system was a bad one, and led to all sorts of abuses; but it made many reductions possible which would otherwise have been out of the question. Forced equality results in leveling up, quite as much as in leveling down. The more general the equalization is made, the more the former effect is likely to prevail. This is not an argument against fixed tariffs or uniform classifications. The benefits of such a system, unless it be carried to a radical extreme, are great enough to outweigh the disadvantages. But it is folly to expect to get the benefits without at the same time suffering a good deal of incidental loss. By care in the classification and in the arrangement of the tariffs, this loss may be much reduced; but no system, however well devised, can avoid it altogether.

The car-load rate case has been argued from an unusually wide public standpoint on both sides. The briefs themselves do a great deal to contribute to an understanding of some of the most vexed questions of railroad method. We sincerely hope that the lessons which they contain will not be lost.

#### Permissive Blocking.

In speaking, in a recent issue, of the block system, we referred to the value and necessity of this safeguard in snow storms, and thereby implied, perhaps, too strongly, that to use it temporarily is as safe and efficient, so far as it goes, as a permanent arrangement. But, at least to those who are cognizant of our previous utterances, it is unnecessary to say that there is need for special caution at this point. As long as train dispatchers can make scores or hundreds of meeting points daily, it is certainly making no violent change in the degree of hazard attached to the business for them to absolutely protect trains from the rear as well as from the front; and it is, therefore, true that when a flagman is made to walk a mile or two in deep snow or to stand an hour exposed to a zero gale the officer responsible for it ought not only to consider his duty to the man as a man, but also to question whether he is not jeopardizing the safety of his trains by appointing the men to tasks which, if not shirked, will certainly impair their efficiency. Because of these considerations it is true that it is better to block temporarily, with proper safeguards, than not to block at all. Notwithstanding this, however, our object in setting forth the merits of blocking was to induce managers to consider the question of adopting the system permanently. To operate it on an extensive scale dependence must be placed on station operators; dispatchers cannot well attend to such a large number of transactions from a single office. This being the case, it will be readily admitted that efficient and safe service can be secured with certainty only by providing and enforcing a rigid system, one in which the force of habit is brought into play as far as possible to aid the system and not to hinder it. Suddenly notifying a hundred stations to put the block system in force for a few days or a less time would involve a chance of encountering a dull or ignorant operator whose blunder would knock over all the special and temporary zeal of the others, while a permanent system would have had both dull and bright operators trained beforehand.

The most serious drawback in regular blocking is the use of the permissive system. This it is that supports such views as "Langdon" expresses in the *Railroad Gazette* of Aug. 24 last, and this, often, is what frightens off those who start to investigate the subject. Rear collisions do occur where blocking is practiced, and superintendents ask, Where are the advantages? In connection with the almost universal plan of placing responsibility beforehand on both trains for all rear collisions, a condition of things is produced which may be said to invite collisions. Conductors, however lax they may be in sending



flagmen back, are bright enough to readily see the big defect in a system which throws an important duty on both the flagmen and the engineer, with a chance for each to depend upon the other, and their knowledge of the actual practice under this principle is what leads them to distrust blocking entirely. Permissive blocking allows enginemen to proceed expecting to find another train in their way; but when this rule is contradicted by the other rule, and the daily practice, which shows them that they will not find unprotected trains ahead, it might almost as well be called "Permissive collisions. Of course every one who carefully examines the facts understands that this broad statement is qualified by the condition that the theory on which present rules are based is generally not given a fair chance. Placing responsibility on both trains might not be an intolerable plan if only the men were drilled to understand and observe it. We make our assertion, however, on the facts as they exist. As long as men can wrongfully shift responsibility, one upon another, time after time without hindrance, the blame must not all be thrown upon the plan.

Another point that needs watching in the permissive system is the proneness of operators to save work for themselves and for the trainmen at the expense of the system. If one wishes to step out of the office for a few minutes he will set his signal at caution, and thus run trains "under control" even when the track is unobstructed and a clear signal might be given if only he would take the trouble to get the authority. After a time this practice, allowable in emergencies, may become common. Where there are long tangents extending from one block station to another, the runners, whether in sympathy with the operator or not, see how this "kink" is worked and lose respect for the signal. Where trains are very heavy there is a temptation to give a caution signal to avoid stopping them, and in this the superintendent naturally sympathizes with the men; but there should be constant vigilance to see that it is not done too much. It should not be permitted at all on down grades, nor where the train can be started again without serious delay. Yardmasters should be made to understand that they must take care not to send trains close together when they can just as well keep them well apart. Runners should be held to strict account for unnecessary stops by reason of their running too close to the preceding train, when a little calculation would have shown it to be both useless and unnecessary.

Admitting that permissive blocking cannot be wholly done away with, there should be a constant aim to reduce it to the lowest limit. The number of caution signals given should always be in small proportion to the "all clear" ones. Then if the runners are taught that "caution" really means caution, by throwing upon them the whole responsibility for avoiding preceding trains, the best results of the system may be expected. In clear weather, on the open road, no matter how crooked the line or obscure the view, passenger trains are run at full speed under all systems; and this is done also in dense fogs. Here we place the responsibility wholly on one side. If it is practicable and safe to do this here, where is the necessity of dividing the responsibility in so many cases?

#### Protection of Trains During Strikes.

In the case of a railroad strike involving the points touched upon by a correspondent in this issue, it is often impossible to say what *ought* to be done without first inquiring what *can* be done. And the answer to the latter question depends more upon the state of public sentiment than upon anything else. This not only controls the actions of the railroad company, but, to some extent at least, the possibilities of legislation.

It is not because mail trains are thought to be more important than others that they are allowed to pursue their course while others are stopped. It is because public sentiment, even in the rougher communities, will not tolerate the stoppage of mail trains, while it will allow high-handed interference with others. Were the railroad to try the experiment suggested by our correspondent, and place mail bags on all its trains, it is extremely doubtful what would be the result. Instead of giving additional protection to such trains, it is more than likely that it would impair the strikers' respect for the sacredness of the mails. Even the attempt by legislation to put both classes of trains on the same legal level might result in leveling down rather than leveling up.

We do not mean to say that the present state of things is satisfactory. On the contrary, we fully agree that "the whole subject should receive more attention than is now given it." While we believe that public sentiment is a factor which must be taken

into account, we do not mean to say that it is always right in its judgments. In this particular case we think that it is wrong, and that in the immediate future it will be and must be greatly modified. The sharp distinction which is to-day drawn between mail trains and others is a remnant of an old order of ideas, no longer suited to existing facts. There was perhaps a time, before the age of railroads, when a carrier was not to be regarded as doing public business except when it carried government property or worked for government account. That time is long past. The railroad to-day, in almost every department of its work, does at least *quasi*-public business. It is not merely a matter of public convenience, but of public necessity, that the work should be done regularly. It is here that our correspondent's arguments have most force. Even if we admit that mails have more public importance than passengers, the difference is one of degree rather than of kind. It is, therefore, illogical for the law or for public opinion to draw a sharp distinction between the two. It is also impractical. The various departments of railroad service are so closely bound together that interference with one involves danger to another.

The *quasi*-public character of railroad business has been legally and publicly recognized in many other aspects than those which arise from strikes or interruptions of traffic. The whole system of Boards of Commissioners, and of government regulation of rates, involves the assumption that the dealings of a railroad with those who use it are not of a strictly private nature. It only remains to carry the same principle to its full extent, and give the railroads the benefits as well as the disadvantages of their character as public servants. It may be a long time before this is really accomplished. The spirit of hostility to corporations retards it. The men who shape legislation more naturally think of the public duties than of the public rights of railroads. It is popular to reduce rates; it is unpopular to interfere with strikers. Nor is the problem a simple or an easy one. A strike cannot be treated as an independent event. It is always a symptom of deeper trouble, and usually indicates some fault on both sides of the dispute. Mere measures of repression often serve to aggravate the evil rather than stop it. Arbitration may serve as a palliative for a time, but in too many instances it merely puts off the difficulty without really removing it. We have no radical solution to propose. Any improvement will probably be a gradual one. But of this we are sure, that the public will not allow its interests to be disregarded in the future as they often have been in the past. It will not allow a big railroad strike to be settled—or remain unsettled—as a pure matter of private business between the parties. It is a quarrel which involves public interests quite as much as private ones. Not only when mail trains are stopped, but when ordinary freight and passenger business is stopped, it is a public disaster, and must sooner or later be recognized as such by the courts.

This course of events is not peculiar to railroad business. It makes itself felt wherever the process of consolidation has been carried to an extreme. Coal strikes and telegraph strikes involve the same sort of difficulties as railroad strikes. When business was done by a hundred different concerns there was a reasonable assurance that all would not be stopped at once. If the public lost the service of one company, it could resort to that of another. But to-day the increased consolidation of capital and more extended organization of labor have made it probable that the stoppage will be universal, and that the public will have no such easy remedy in its hands. Under the circumstances it is becoming necessary for the law to treat strikes as a public question and stoppages of business as a public wrong. Public opinion has not yet reached this point, but each disastrous experience brings us nearer to it. Just what form the law will take no one can as yet tell. It is safe to say that it will not throw the whole responsibility on either party to the labor dispute. It will not be able to hold companies responsible for the stoppage, unless it gives them a greater control over their workmen than they have at present; it will not be able to extend the criminal liability of the striking workmen without at the same time defining more fully their rights against the company.

In the last few years the increase in the size of steamships has been even more conspicuous than that in locomotives and cars. The principle involved is the same in the two cases. A large steamship under good conditions requires more fuel, but at the same time the net carrying power increases much faster than the fuel consumption, while the expenditure for wages becomes relatively small. Fifteen years ago 5,000-ton

steamships were considered large, and 16 knots an hour was looked upon as an unprofitable speed. To-day a company which wishes to carry on the ocean passenger business with success finds itself almost compelled to surpass both these figures. The severe check to steamship profits a few years ago hardly made itself felt as a hindrance to this development, because it was found that the old steamers were so often more unprofitable than the new ones. With the expansion of trade in 1887 and 1888 matters are being carried further than ever.

The most conspicuous instance of enterprise just at present is that of the Hamburg line, which has for some time past been running slow boats, but which has now under construction four twin screw steamers of 12,500 horse-power and 10,000 tons displacement. One, the "Victoria Augusta," has already been launched at Stettin. The second is under construction in the same yards, while the third and fourth are being built by Laird on the Mersey. Nor are these the only first-class additions to the Atlantic fleet. The Inman line will, during the coming season, run the "City of Paris" as a companion ship to the "City of New York," each of these boats having a tonnage of 10,500. The White Star line has two new steamers of the same general class, which were intended to be the fastest vessels on the Atlantic. One, the "Teutonic," has just been launched, while its companion ship, the "Majestic," is expected to be regularly running before the close of the season. All these boats have twin screws, longitudinal as well as transverse bulkheads, and two sets of triple expansion engines.

The use of large and swift steamers is most marked on the North Atlantic lines, but it is by no means confined to them. The Peninsular & Oriental Company, usually very slow to adopt improvements, is building a new boat of 5,500 tons measurement and 5,000 horse-power. The Canadian Pacific Company has ordered three 5,000 ton steamships of high speed for the postal service between Vancouver and Japan. The Spanish *Compania Transatlantica* has built two new boats of little less than 5,000 tons, available as auxiliary cruisers for the Spanish navy. We note further that regular service between France and Madagascar is now to be maintained by steamers of 4,500 tons burden.

Nor does the improvement show itself merely in the construction of rapid passenger steamers. Provision is made for stowage passengers and for freight, and there is a constantly increasing tendency toward separation of the different lines of business by the construction of steamers especially suited for one or the other. The North German Lloyd has just had built on the Clyde the steel steamship "Dresden," of 4,500 tons, with triple expansion engines, which is arranged to carry 2,000 emigrants, and a sister ship is in process of construction. It is remarkable as showing the development of marine architecture that the "Dresden" was built in 100 working days. Among freight boats we note that a new petroleum steamer of 3,000 tons burden, whose tank compartments have a net capacity of 18,500 barrels of oil, has been built at Newcastle for an Antwerp house. The same house has a petroleum sailing vessel of similar construction, whose success has encouraged the present experiment. The construction of steamers specially adapted for the cattle trade is also found profitable.

The use of triple expansion engines is becoming more and more general. They are not merely found in the fast passenger steamers, but in the best constructed emigrant and freight boats. Experiments, apparently successful, have been made on at least one new steamer with quadruple expansion engines, the cylinders being arranged in pairs, one above the other.

In spite of this development of steam, sailing vessels do not seem to be completely displaced. We note that a four-masted sailing vessel of more than 5,000 tons net carrying capacity has been built for Liverpool parties. It measures 333 ft. long, 48 ft. beam and 26½ ft. depth, and is intended for the Australian service. Two other sailing vessels of substantially the same size have been ordered by a house at Bordeaux. The effect of these various changes in reducing ocean freights in the immediate future cannot fail to be very great.

A correspondent sends us the following typical case, showing the difficulties connected with demurrage:

"A firm located in a small town, and using an engine and boiler, had its factory on or adjoining the railroad company's grounds and used a side track, having connection at only one end. This track held three cars, and the coal for the engine was unloaded directly into a shed erected for that purpose. The capacity of the shed is about twelve cars. There was used on an average about two cars per week. The arrangement with the coal company was to ship two cars per week (distance, 138 miles); this was done regularly, but lately none was received for a long time, the firm towards the last getting out entirely and having to get a temporary supply from another source. One day two trains came along and set out 15 cars for this concern, and because they were not unloaded promptly within the allotted time the agent attempted to collect demurrage. The firm would not pay, and the agent appealed to and was sustained by the Division Superintendent; the firm still refused, and the matter was taken to headquarters, where after some delay the charge was withdrawn. With two cars per week no extra force was required, as the men unloaded the coal in addition to other work. To some extent this may be an exceptional case, but it is not wholly so, as there are frequent delays."

The remedy for cases of this kind is, of course, easily seen by all interested; but the point is, not how to cure the evil, but how to prevent it. In the first place a track on which only two cars can be unloaded without switching, allows no margin for irregularities. If the consignee had hired a lot of extra shovelers the chances are that the road would have hindered their work by not switching out the empty cars promptly. A road which wants business badly enough to put in a special side track certainly should look ahead a little. While it was, perhaps, not unfair to take this case to head-



quarters before settling it, there was no just ground for more than a day's delay, or two days at the outside. Such questions should be easily adjusted by wire. With telegraphing almost as cheap as the mail, the slow methods of routine are out of date. In fact the telegraph is used for larger affairs; why not for one like this? Where shall the line be drawn? If the station agent cannot state the case fully, fairly and with brevity, there should be a new agent. If the division superintendent does not know the locality and at least have a general idea of the causes of the delay, he has failed to qualify himself for his position or has not kept track of his work, or both. If the general superintendent cannot trust the lieutenant and sub-lieutenant just mentioned, to settle cases of this kind, he should begin to question whether a railroad can be run on the theory that one ten-thousand-dollar man can afford to examine the details of the work of several hundred subordinates. In other affairs questions like this are not delayed unless there is a motive for delay. Railroads being semi-public (or wholly so) such motives are not allowable; at all events they are quickly and loudly complained of, and the complaints are constantly causing trouble. If demurrage complaints are not promptly settled, both with small customers and large ones, railroad men must not be surprised if schemes for demurrage, to be paid the consignee in case of delayed shipments, are persistently pressed and perhaps embodied in laws.

The United States customs department has issued an order requiring all Canadian cars used as part of a through line between Atlantic points and the West by Canadian routes to be held at Detroit until the import duty on each car be paid. The order fell like a bomb among the railroads at Detroit, says a dispatch. It has always been the practice to use Canadian cars in common with American for through transportation, and the practice has been sanctioned by the government. American built cars have been freely permitted to pass not only through Canada but to be used in the transportation of merchandise between Canadian points. Probably a much larger number of American built cars have been used in these lines than cars of Canadian construction. An effort will be made to have the order suspended, at least temporarily.

This decision seems to have originated in the opinion that a car starting, say, from Chicago, and destined for Boston via the Grand Trunk, should be domiciled and taxed in the United States. A Grand Trunk car engaged constantly in this traffic would be in the United States much the larger share of the time, and, therefore, could plausibly be deemed to have been imported into this country. The justice of the arrangement heretofore in force depends, of course, upon the assumption that each road in a through line furnishes its proper share of the cars for use in the joint traffic, though even then inequalities would be unavoidable, as the time spent upon the road or the mileage traversed would be very inexact bases for estimating the comparative value of the car to the Canadian and to the American road. If 1,000 Canadian cars were constantly used in the traffic cited, the American road would in effect be constantly using a large number of imported cars on which no duty had been paid; and if no American built cars were used in the line the case would be comparatively clear. On the other hand, if American roads owned all the cars used in this traffic the Canadian roads would have to be constantly hiring cars which they could more profitably own.

#### NEW PUBLICATIONS.

*Tables for Laying out Accurate Profiles of Gear Teeth.* By Professor J. F. Klein, Lehigh University. For sale by Edwin G. Kloss, Bethlehem, Pa. Price, \$2.

The importance attached to the ready practical application of theoretical developments in the line of gear teeth formation lends interest to every new addition to the subject, and Professor Klein's gear tables, which have just been issued, are noteworthy. The theory of gear teeth seems to be nearly perfect, but in constructing them for actual work, old rules and clumsy devices are still used by a large number, to whom the mathematical and scientific character of the subject has proved, in a great measure, discouraging. It was with special pleasure, therefore, that we noted the author's statement that care had particularly been taken to make the tables convenient for pattern-makers and machinists as well as for draughtsmen, engineers and technical students. We were somewhat disappointed, however, on further examination to find that the application of what at first seemed to be a very simple system, entailed some complication which, to the practical workman, would prove objectionable at once and might easily lead to an unfavorable decision on his part. Much of the difficulty would arise from the fact that the explanations which are given of the use of the tables in the shape of examples, worked out and illustrated by figures, are not as complete as they should be, and the user is in many respects left to his own conclusions, which, obviously, may be entirely misleading. No doubt, to some the examples will be perfectly clear, but to many others they will suggest questions to which no satisfactory answers are available. This is to be regretted all the more, as it could have been easily avoided.

Primarily the object of Prof. Klein's tables is to enable one to lay out tooth profiles by the simplest means, and his methods, therefore, involve only simple arithmetic, the use of the square, and the ability to accurately lay off distances. These are measured off on vertical and horizontal reference lines, constituting what the engineering student knows as ordinates and abscissae, and the points determined in this way are points on the tooth profiles. The figures in the tables corresponding to the vertical and horizontal distances are ex-

pressed in different cases in terms of the pitch, and of the wheel diameters, and to find the actual distances, therefore, only a simple multiplication or division, as the case may be, becomes necessary. All this is simple enough, and commends itself both for rapid and accurate work, the tabular values, we understand, having been prepared with great care. Altogether there are nine tables, which, with the illustrative examples and figures, cover both sides of a 17 x 20 in. Bristol board card, and are thus convenient for reference. The first three tables are for cycloidal rack teeth, and the fourth and fifth for involute profiles. Table VI. was prepared to permit the ready location of the reference lines for each side of a tooth space; table VII. also is designed for locating reference lines, and for laying out the straight profile of any involute rack. In using this table the square root is brought into play, being, in this respect, exceptional. The last two tables are respectively for epicycloidal and hypocycloidal profiles, and were computed with special reference to the common system used in England and this country.

The contents of the *Journal of the Association of Engineering Societies* for January are: Lattice Girder Overhead Crossing—Chicago, Santa Fe & California Railway; Inspection of Iron Bridges and Viaducts and Discussion; Classification of Material in Railroad Construction and Discussion; Henry Francis Walling—Memoir; Report on Civil Engineering and Surveying Progress and Discussion; Condensers for Steam Engines; Society Proceedings, and the Index to Current Literature. The *Journal* is published for the Societies by the *Railroad Gazette*.

#### TECHNICAL.

##### Technical Notes.

The Martin system of continuous steam heating for passenger cars is now being tried on the Terre Haute & Logansport division of the St. Louis, Vandalia & Terre Haute.

The chief government engineer of railroads, Canada, has reported that the interlocking switch put in at the crossing of the Canada Southern and the Erie & Huron is imperfectly secured.

The Baltimore & Ohio now runs four daily trains between Philadelphia and Washington in three hours, and it is stated that only on three occasions since Nov. 18 has a train failed to make this time, and the maximum delay was 15 minutes.

##### Locomotive Building.

The Louisville & Nashville has received from the Rogers Locomotive & Machine Works five new consolidation locomotives, 21 x 24 cylinders, and is about to build four passenger engines at the company's shops, with 18 x 24 cylinders.

The Schenectady Locomotive Works have just completed for the New York Central & Hudson River 10 heavy freight locomotives.

The Pittsburgh Locomotive and Car Works have nearly completed for the St. Louis, Vandalia & Terre Haute three locomotives.

The New York, New Haven & Hartford has ordered 10 18 x 24 engines of the Rhode Island Locomotive Works, Providence, R. I.

The Cleveland, Columbus, Cincinnati & Indianapolis has let a contract to the Schenectady Locomotive Works for building six locomotives.

##### Car Notes.

In addition to the contract for 700 freight cars which the Cleveland, Columbus, Cincinnati & Indianapolis recently let to the Pullman Car Co., the road has also let to the Terre Haute Car Works a contract for building 400 freight cars.

The Receiver of the Wabash has been authorized to expend \$10,500 for the purchase of three new postal cars.

The Pullman Car Co. has nearly completed at its works at Pullman, Ill., 200 coal cars for the Colorado Midland.

The Buffalo Car Manufacturing Co. is building 150 box cars for the Delaware & Hudson Canal Co., and also 200 box cars of 50,000 lbs. capacity for the Cleveland, Columbus, Cincinnati & Indianapolis. The company will soon erect new paint shops, and will also build an addition of 80 ft. to the mill.

The Cincinnati, Hamilton & Dayton has received bids for building 200 box cars.

##### Bridge Notes.

The Flint & Pere Marquette has let the contract for the construction of the "Belt Line Bridge" across Saginaw River to the Smith Bridge Co., of Toledo, Ohio. There will be one iron draw space 190 ft. over all, and two fixed spans 130 ft. each, centre to centre end pins. The pier for the draw will be stone, and 23 ft. in diameter.

Shailer & Schniglan, of Chicago, have recently been awarded the contract for a 200-ft. drawbridge over the Chicago River, at Deering street, Chicago.

The contract for building the iron bridge across Rough River, at Leitchfield, Ky., has been let to the Champion Bridge Co., of Wilmington, O., at \$3,050 for the iron work. The contract for the stone work and the approaches was let to John Moorman, of Falls of Rough, Ky., at \$2,600. The work is to be completed by Sept. 1.

The Ottawa River Bridge Co. ask incorporation of the Canadian Parliament for power to construct a railroad and passenger bridge across the Ottawa River from Rockcliffe, near the city of Ottawa, to a point opposite in the province of Quebec.

The contract for building a bridge at Wilmington, Vt., has been let to the Vermont Construction Co., of St. Albans, Vt.

The Shepard Bridge Co. has been awarded the contract for building a swing bridge over the Cayuga Canal at Ithaca, N. Y.

The County Commissioners will erect at Pulaski, Mich., an iron bridge, to cost \$10,000.

The Boston & Maine is to build a bridge at Salmon Falls, N. H.

At Harrisburg, Pa., nearly \$125,000 has been subscribed toward the building of a new iron bridge, to cost \$300,000, across the Susquehanna River, at that place.

The Cumberland Valley Railroad is to build an iron bridge across the Baltimore & Ohio tracks at Cumberland, Md.

Surveys are being made at Parkersburg, W. Va., to locate the position for two bridges which it is proposed to build across the Little Kanawha at that point.

The Pittsburgh & Lake Erie will, it is reported, build an expensive bridge at Beaver, Pa.

The city authorities of Grafton, W. Va., propose to build a bridge across the river at that point.

The Louisville, New Albany & Chicago has completed two iron bridges over White River, one at Gosport and the other at Bedford, Ind. They are each 460 ft. long and cost \$56,000.

Work upon the new Stanislaus River Bridge of the Stockton, Fresno & Southern road will be commenced in about two months by the American Bridge & Building Co. The American Bridge Co. has the contract to build 12 bridges for the road, at an aggregate cost of \$150,000.

Bids for the Cow Creek Bridge, in Shasta County, Cal., were: American Bridge Co., for an iron combination, \$2,650; iron combination, iron piers, \$3,250. A. W. Hubbard, for wood and iron bridge, \$2,750.

#### Manufacturing and Business.

Ruffner, Dunn & Co., of Philadelphia, manufacturers of the Excelsior nutlock, report that they have more than doubled their business during the past year. An order for 100,000 of these nutlocks has just been received from the Cleveland, Columbus, Cincinnati & Indianapolis, and several other large orders are being negotiated.

The Ross-Meehan Steel Brake Shoe Co. has been organized at Chattanooga, Tenn., with a capital stock of \$70,000, and will manufacture the Sargent steel brake shoe.

Mr. W. Hildebrand, Consulting Engineer for the Roebling Works, has opened an office at No. 1 Broadway, New York, for general engineering work in connection with suspension bridges. He is also the American representative of Herr Roman Abt for the introduction of the rack-rail systems for railroads of steep gradient.

The Cincinnati Corrugating Co., of Cincinnati, O., has recently purchased the machinery, etc., of the iron roofing firm of Caldwell & Co. The latter was established in Cincinnati over 30 years ago. They were engaged principally in the manufacture and sale of the Outcalt patent elastic joint iron roofing.

It has already been noted that the Reed car replacer is now controlled by the Dunham Manufacturing Co. It is an excellent device, and is highly spoken of by those who are using it.

Work is in progress on the new electric railroad at Cincinnati, O., which is being built for the inclined system of that city. The road will be equipped with 20 cars to start with, the new Boston type Sprague motor being used, with separate trucks.

The Dunham Manufacturing Co., of Boston, sole agents for the Globe ventilator, report sales since Jan. 1 to the Boston & Albany, New York Central & Hudson River and Memphis & Charleston roads, and the Pullman Palace Car Co.

Mr. G. E. Pratt, who had charge of the construction of the Chataqua Lake road, and was subsequently Assistant to the General Manager of that road, has recently associated himself with Thomas B. Inness & Co., railroad contractors and dealers in railroad equipment, 115 Broadway, New York City.

The Reynolds & Henry Construction Co., of Joliet, has been chartered in Illinois to construct railroads. The capital is \$5,000,000, and the incorporators are J. A. Henry, Charles H. Talcott and Julius W. Falk.

The annual meeting of the stockholders of the Transcontinental Car Lock & Seal Co., of Chicago, was held in Chicago Jan. 16. The following were elected directors for the ensuing year: Warren G. Purdy, John Johnston, Jr., Hobart Chatfield Taylor, J. Edwards Fay, Wm. F. Donovan, Chas. E. Davis and John W. Norris. The new board of directors elected the following officers: John W. Norris, President and Treasurer; Warren G. Purdy, Vice-President; J. Edwards Fay, Secretary, and Chas. E. Davis, Superintendent.

The Railway Cab Electric Signal Company, of No. 42 Broadway, New York city, is in the hands of the Sheriff, on executions aggregating \$5,000. The company was incorporated in 1882.

#### Iron and Steel.

Last week the converting, blooming and rail mill of the Bessemer department of the Bethlehem Iron Co. were closed for an indefinite period, and two blast furnaces will be blown out. In the ordnance department work will this week be commenced on 8 and 10-in. guns.

The two Fox River charcoal furnaces, at West Desere, Wis., are to be dismantled in the spring.

The Aetna Machine Co., of Warren, Ohio, has closed a contract with the Chicago Splice Bar Mills, owned by Morris Sellers & Co., of Chicago, to furnish them with a 500 horsepower engine to drive a train of rolls in their mills in that city.

Julian L. Yale has been appointed General Sales Agent for the entire product of steel rails of the North Chicago Rolling Mill Co., the Union Steel Co. and the Joliet Steel Co. His office is located in the Rookery Building, Chicago. Mr. Yale was formerly engaged in the railroad equipment and supply business, at Cleveland, O.

Mr. Henry Clay Frick, of the Frick Coke Co., has purchased the interest of the late David A. Stewart, in the Carnegie firms. Mr. Frick has been elected Chairman of Carnegie Brothers & Co., Limited, Pittsburgh, Pa.

It is probable that the plant of the Warren Tube Co., at Warren, Ohio, will be disposed of at an early date. The plant has been appraised at \$89,000.

The furnace owned by the Niagara River Iron Co., at Iron-ton, near Buffalo, N. Y., will again be put in operation. The furnace has been idle nearly 12 years. It originally cost about \$400,000. The plant will be put in order and it is expected that the furnace will be blown in about April 1st. At present there is not a furnace in operation at Buffalo.

The Nashville Iron, Steel & Charcoal Co., doing business in West Nashville, Tenn., has made an assignment for the benefit of its creditors. Robert L. Morris is named as the assignee, and the liabilities, including bonds, are \$170,000, with assets of \$450,000. The officers say that the company will be reorganized and will resume operations in a short time.

#### The Rail Market.

*Steel Rails.*—Sales reported by Eastern mills, says the *Iron Age*, foot up to about 16,000 tons, of which 10,000 tons were taken by a New England road from two Eastern Pennsylvania mills. A lot of about 2,500 tons for the Pacific Coast has also been sold, and an order for 7,000 tons for a Virginia road and for 7,000 tons for an Illinois road will soon be closed. Quotations are nominally \$27.50@28 at eastern mill, but orders depend much upon freight rates obtained.

*Old Rails.*—Sales of 500 tons of foreign tees at a price equal to \$23.50 at Jersey City, and of 150 tons to an Eastern Pennsylvania mill is the only business reported. A lot of



500 foreign tees is offered at \$23. Quotations are \$23@ \$23.50.

**Track Fastenings.**—Quotations for spikes are 2.05@2.10c. for large quantities, and angles at 1.85@1.90c.

#### Fall of a Bridge.

The draw span of a new bridge on the Louisville, St. Louis & Texas Railroad over Green River at Spottsville, Ky., fell into the river on Sunday, carrying with it about 20 men, 4 of whom were drowned and several more injured fatally. The builders, the Keystone Bridge Co., had retained possession of the bridge, preventing the running of trains over it for the purpose of securing their pay; the railroad company then got an injunction restraining the bridge company from interfering with the running of trains. Complications ensued and the bridge company's men commenced tearing up the track from the draw. About 3 p. m. the dismantling at one end of the draw is said to have lightened it so that the weight of the other arm broke it in two. The loss on the bridge will be heavy.

#### New Rails for the C., C. & I.

The "Bee Line" will relay a large part of its track during the year 1889 with a 65-lb. rail. A large order for rails has been placed with Pittsburgh mills.

#### Electric Lighting on the Chicago, Milwaukee & St. Paul.

The C., M. & St. P. train out of Chicago in the evening, for St. Paul, is now lighted by electricity. The dynamo is placed in the forward end of the baggage car, and the power is supplied by the locomotive. Attached to the dynamo is a storage battery capable of supplying light for all the cars in the train for six hours.

#### The Thurmond Car Coupler.

The Thurmond Car Coupling Co. has withdrawn from the Consolidated Coupler Co., and will hereafter work independently. The company asserts that the improved Thurmond coupler is far superior to the old form. It will be put on the market at once.

#### Manganese Ore in Vermont.

The Boston *Advertiser* learns that a large vein of manganese ore has been opened at South Wallingford, Vt., which is said to be three miles long. Carnegie Bros. mining engineer says it assays 50 per cent. of manganese. At present 15 tons are being mined daily and it is expected that by means of improvements now in the course of execution the quantity shipped can be doubled by the first of next month.

If the above information is correct a decided increase in our production of manganese ore is probable. Ores containing manganese are divided into two classes. Ores containing over 44½ per cent. of metallic manganese are classed as manganese ores, and those containing less than 44½ per cent. are known as manganiferous ores. The first, which command a price of about \$10 per ton, are mostly used in chemical and manufacturing works, while those with less manganese are employed in steel making.

The production of manganese ores in the United States for 1887 was as below, in long tons:

Virginia.....	19,853
Georgia.....	9,024
Arkansas.....	5,651
Other states.....	14

Total..... 43,524

Manganiferous ores are more widely distributed.

#### Manhattan Bridge.

It is expected that this bridge, crossing the Harlem River at 181st street, New York City, will be opened for public use on Washington's Birthday.

#### A Fast Ship.

The pneumatic dynamite gun cruiser *Vesuvius*, built by the William Cramp & Sons Ship and Engine Building Co. for the United States Navy, was tested last week over the official course, outside the Delaware Breakwater. It attained a speed of 21.64 knots an hour, an excess of 1.64 knots over the speed required by the contract. This surpasses all records heretofore made.

#### Railroad in Japan.

A new railroad is projected in Japan, which it is noticeable will get its rails and other iron from Austria, the negotiations having been conducted at Yokohama with the Austro-Hungarian Lloyds, which company, of course, carries the material. The road is to be 125 miles long, and the *Railway Press* thinks "this is an opportunity that should not have been lost by British manufacturers."

#### Blast Furnaces in the United States.

The *American Manufacturer* gives the following table showing the number of furnaces in blast for the two years:

	Jan. 1, 1889	Jan. 1, 1888
	No. capacity.	No. capacity.
Fuel.....		
Charcoal.....	71 13,213	73 13,257
Anthracite.....	108 31,837	117 35,259
Bituminous.....	154 97,117	151 92,224
Total.....	333 142,167	341 140,720

Showing that there are eight less tower furnaces in blast, but an increased weekly capacity over 1,447 tons of that of last year.

#### New Style Sleeping Cars.

The Wagner Palace Car Works have under construction four vestibule sleeping cars for the New York & Chicago limited express over the New York Central & Lake Shore, which are of entirely new design. Each section is a stateroom extending nearly across the car. The aisle extends along one side of the car to the middle of its length where it crosses over to the other side, thus placing one-half of the staterooms on each side of the car. The seats and berths are arranged the same as in the regular sleeping-car section. Complete lavatory accommodations are to be provided in each room, and one-half of them will be furnished with hoppers. The water in the tanks is under air pressure, so that no pumping is required. The usual toilet rooms are to be placed at the ends of the car. Doors between the sections will enable them to be made into suits of rooms. Each room is most elaborately finished in a wood which differs from the adjacent rooms. A handsome bookcase and a bracket for a water pitcher are to be placed in the angles at the cross-over passage. The cars are to be wired for electricity and piped for gas, so that either light can be used.

#### Riehle Testing Machine.

A vertical screw power testing machine of 100,000 lbs. capacity, built by Riehle Bros., of Philadelphia, for the Thompson Electric Welding Co., of Boston, has recently been examined by an army board composed of Col. F. H. Parker, Lieut. J. W. Benet, and J. E. Howard, C. E. The machine is adapted for tensile specimens up to 2 ft. long; round specimens up to 2 in. diameter; square specimens up to 2 in. square; flat specimens up to 3 in. by 1 in.; transverse and

compression specimens up to 2 ft. long; compression surfaces up to 4 in. diameter. The motion of the pulling head is 2 ft. 4 in.

The machine has a box-stand of cast iron, supporting a system of levers. Two main levers, nearly equal in length, and very stiff, transmit the pressure to an intermediate lever and thence to the weighing beam. The scale table, which is stiffened by ribs, rests upon the series of eight knife edges of the main levers. The upper cross-head is attached to columns which rest on the scale table, and the lower or moveable head is operated by two powerful screws working in nuts secured to the head. The thrust of these screws is taken up by an anti-friction bearing, consisting of a series of hardened steel balls revolving between two grooved steel plates. A patent wedge grip is used to hold the specimens, and levers are provided to suit variations in size. The lower grips are supported and forced into place by a swinging platform, and a recoil arch on the upper head secures grips and specimens from flying out of the head. The screws connected with the lower head carry spur gears engaging with a small pinion, and the pinion shaft has a large bevel gear and a small mitre gear, either of which can be made to engage with the pinion and mitre gear of the driving shaft, thus giving a quick or slow speed of the screws, at pleasure. Another system of gear wheels gives two more changes of speed, and a friction gear enables each of the above force speeds to be varied, while a belt gear of open and crossed belts controlled by a reversing lever enables the attendant to reverse the motion; the result of all these combinations being to give eight testing speeds, and four reverse speeds. The weighing beam carries a vernier poise, which can be moved by a hand wheel without sensibly affecting the sensibility of the beam, so that the latter can be kept continually in equilibrium while testing a specimen. The vernier gives minimum readings of 10 pounds.

The examining board report, as a result of their inspection, that the recoil in the rupture of a specimen is very slight, and is taken up without shock by four rubber cushions. The high faced wedge holders are highest along the central longitudinal line, so that the specimen is held from the centre without any tendency to rupture at the edges. The board states that "the Riehle's patent wedge grip, if properly used and suitably adjusted when unfinished specimens are to be tested, is the best device in general use in ordinary testing machines known to the Board."

The Riehle weighing beam "is considered by the Board an excellent arrangement, combining ease of manipulation, convenience, and rapidity."

As to the thrust bearing, they say that it "seems to the Board an effective means of reducing the friction, but the durability of the device can only be tested by continuous use under heavy stresses."

The system of gearing for changing speeds is regarded by the Board "as a specially meritorious feature of the machine."

In conclusion, it is remarked that "the Board is of the opinion that the machine examined is constructed on correct mechanical principles, the parts are well disposed, and there seems to be no reason why such a machine should not give results of sufficient accuracy. It is subject to the objection that inheres in all knife-edge machines, and the defect of friction on the fulcrums. If these parts are made with great care and of the hardest materials the amount of this friction is reduced to a minimum."

#### The Westinghouse and United States Companies.

It is announced that an agreement has been made between the Westinghouse Electric Co. and the United States Electric Lighting Co. whereby the business of the two companies shall hereafter be conducted for mutual benefit, both in the manufacture and sale of electrical apparatus and in the management and protection of their patents. The new combination has a manufacturing capacity of over 15,000 lamps a day, and the two companies own and control about 700 patents on electrical inventions.

## General Railroad News.

### MEETINGS AND ANNOUNCEMENTS.

#### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Central Ohio*, 3 per cent. on the common and preferred stocks, payable Jan. 31.

*Illinois Central*, semi-annual, 2½ per cent., payable March 1.

*Rome, Watertown & Ogdensburg*, 3 per cent., payable Feb. 15.

*St. Paul, Minneapolis & Manitoba*, quarterly, 1½ per cent., payable Feb. 1.

*Sandusky, Mansfield & Newark*, 3½ per cent., payable Jan. 1.

*Wrightsville & Tennille*, 12 per cent., payable Jan. 1.

**Meetings.** Meetings of the stockholders of railroad companies will be held as follows:

*Cumberland Railway & Coal Co.*, annual meeting, Montreal, Can., Feb. 13.

*Fort Wayne & Jackson*, annual meeting, Jackson, Mich., Jan. 25.

*Kingston & Pembroke*, annual meeting, Kingston, Ont., Feb. 13.

*Lincoln Park & Charlotte*, special meeting, 36 Wall street, New York City, Feb. 13, to consider whether \$350,000 bonds shall be issued and whether the road shall be leased to the Buffalo, Rochester & Pittsburgh.

*St. Catharines & Niagara Central*, annual meeting, Montreal, Jan. 28.

*Sheffield Terminal Company*, annual meeting, Sheffield, Ala., Jan. 31.

#### Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Institute of Mining Engineers* will hold its nineteenth annual meeting in New York City, Feb. 19. The hotel headquarters will be at the Union Square Hotel.

The *National Association of Railway Surgeons* holds its annual convention in St. Louis, Mo., May 2, 1889.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month

at the House of the Society, 127 East Twenty-third street New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m. at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m. on the third Saturday in each month.

#### Engineers' Club of Philadelphia.

The eleventh annual meeting was held Jan. 12, 1889, President Joseph M. Wilson in the chair; 60 members and 2 visitors present.

The Secretary and Treasurer presented his annual report for the fiscal year 1888. The following is a statement of the treasury accounts:

Balance Jan. 14, 1888.....	\$586.48
Receipts.....	4,159.62

Expenditures.....	\$4,746.10
	4,632.09

Balance Jan. 11, 1889.....	\$714.01
Other assets, about.....	1,739.54

Next assets about.....	\$2,453.55
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An analysis of the accounts shows a virtual increase of surplus of about \$562.50.

The above net assets do not include either dues for 1889 yet unpaid, or the value of the library and furniture.

#### Membership.

	Hon.	Act.	Assoc.
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At the end of 1887.....	2	462	11
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Additions.....		52	5
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Deceased.....		2	16
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		514	..
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Resignations, etc.....		512	
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At end of 1888.....	2	497	13
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Net increase of active membership, about 8¼ per cent.

#### Residence of Active Membership.

Philadelphia.....	229
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Pennsylvania (outside of Philadelphia).....	105
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All other states and countries.....	163
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	497
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President Joseph M. Wilson called the attention of the club to prospective efforts to interfere with the excellent organization of the U. S. Coast and Geodetic Survey. Prof. Arthur Beardsley presented a preamble and resolution urging upon the Government the great importance and desirability of maintaining both the present status of the survey and the methods by which its management is selected. Prof. L. M. Haupt seconded these resolutions, and after several members had spoken upon the subject, the preamble and resolutions were adopted.

The retiring President, Mr. Joseph M. Wilson, delivered the annual address, which was devoted to an historical account of bridges from the earliest times on record to the present day. A large number of the more notable constructions, in wood, stone, iron and steel, were specifically mentioned. Some account was given of the history of the manufacture of iron and steel, and their particular advantages in bridge construction, resulting in their almost universal use for the building of the permanent bridges of the present day. Questions of failures were also considered, and suggestions made in reference to this subject.

The following were elected officers for 1889: President, William Sellers; Vice-President, Prof. Arthur Beardsley; Secretary and Treasurer, Howard Murphy; Directors, T. M. Cleemann, Frederic Graff, Prof. L. M. Haupt, Washington Jones, Joseph M. Wilson.

President-elect William Sellers was unable, on account of illness, to be present this evening, so Vice-President-elect Arthur Beardsley took the chair, with appropriate remarks, and the fiscal year 1889 was duly opened.

#### National Association of General Baggage Agents.

The annual convention of this association was held in San Francisco, Jan. 16 and 17, several hundred delegates being present. A committee was appointed to secure National legislation upon the subject of the transportation of dead bodies. The following officers were elected for the ensuing term: President, T. S. Newton, Detroit; Vice-President, W. J. Robinson, Cincinnati; Secretary and Treasurer, J. E. Quick, Detroit. The convention adjourned to meet in Detroit July 17 next.

#### Boston Society of Civil Engineers.

A regular meeting was held Jan. 16, President Fitzgerald in the chair. Messrs. Arthur G. Fogg, Henry M. Howe, Walter H. Richards and Walter S. Whiting were elected members of the society. A letter from the Engineers' Club of Kansas City, with reference to means for transferring membership from one local society to another, was read and referred to the government for report at the next meeting. Mr. Henry Manley was appointed a committee to arrange for the annual dinner on the second Wednesday in March, and a sum appropriated for the purpose. A paper by Mr. George H. Barrus on Duty Trials of Pumping Engines was read by the Secretary and briefly discussed.

#### Western Society of Engineers.

The annual meeting was held at Webber's restaurant, Chicago, Jan. 8, President Gottlieb in the chair, and about 40 members present. As the result of the election the following officers were chosen for the coming year, Mr. Strobel having withdrawn his name as a candidate for the presidency before the ballot was completed: President, E. L. Cortell; First Vice-President, Charles McRitchie; Second Vice-President, Samuel McElroy; Secretary, John W. Weston; Treasurer, H. W. Parkhurst; Librarian, G. A. M. Liljencrantz; Trustee, Charles Fitz Simmons.

Certain amendments to the by-laws of the society were presented and laid over for discussion at the next meeting. Retiring President, Mr. Gottlieb, spoke, informally, in regard to the work of the year, as also did Mr. Weston, the retiring vice-president. The Secretary presented his annual report. The present membership is 191. There was a net loss during the year of four from the membership. There has been a gratifying increase in the attendance and interest at the meetings.



**Engineers' Club of St. Louis.**

The 300th meeting was held Jan. 19, 23 members and 3 visitors being present. In the absence of the President and Vice-President, Mr. Robert Moore was called to the chair. The question of the transfer of membership from one society to another was brought up and made a special order for consideration at the next meeting. Mr. Carl Gayler read a paper on "Wrought Iron and Steel Eye Bars," calling attention to the difference between European and American practice. He showed how the form of the eye bar has been greatly improved by the use of the testing machine. Wrought iron eye bars have had their day, and steel is now the metal almost universally employed. The two difficulties to be guarded against are overheating and excess of phosphorus. The discussion was participated in by Messrs. Johnson, Wheeler, Seddon and Moore. The Secretary read a paper by Prof. A. E. Phillips on the Burr Truss, descriptive of a bridge near Lafayette, Ind., and showing its dangerous condition. An interesting discussion followed. Mr. Smith told of a similar bridge near Cincinnati, which had been used for many years and is still in good condition. The arch is of beech wood, firmly built into masonry. Mr. Moore mentioned a wooden bridge which has stood nearly 50 years.

The Secretary read a memorial to the state Legislature of Missouri, and the draft of an act to promote the safety of bridges, which had been prepared by the Engineers' Club of Kansas City. Messrs. Seddon, Johnson and Gayler were appointed a committee to draw up a memorial to the Legislature indorsing the bill.

**PERSONAL.**

—Mr. C. C. Wentworth has resigned his position as Principal Assistant Chief Engineer of the Norfolk & Western.

—The Senate has confirmed the nomination of Walter L. Bragg, of Alabama, to be Inter-state Commerce Commissioner. General Bragg's new term will extend to Jan. 1, 1895.

—Mr. C. L. Gould, Chief Engineer of the Cleveland & Marietta for a number of years, has gone to Chili with the McArthur Brothers, contractors on the new government railroads in that country.

—Mr. S. W. Eccles, General Freight and Passenger Agent of the Mexican International, having resigned to accept service with the Union Pacific as General Agent of the Freight Department on the Pacific coast, W. W. Mackenzie, Traffic Agent, has been appointed to succeed him.

—John Bailey, Master of Maintenance of Way of the Boston & Maine, died in Merrimac, Mass., Jan. 17, after a long illness, at the age of 71 years. Mr. Bailey entered the employ of the Boston & Maine in May, 1839, and had been in continuous service ever since, a period of nearly 50 years.

—Mr. A. J. Porter, who has been with the Louisville Southern since its opening, and who has been Superintendent of Transportation since the lease of the road to the Louisville, New Albany & Chicago, has resigned his position on that road, but will retain his place as Superintendent of the Kentucky & Indiana Bridge Co.

—Mr. C. D. McKelvey, General Superintendent of the New York, Susquehanna & Western, has tendered his resignation, to take effect Jan. 28, and, it is stated, has accepted an appointment on the New York Central & Hudson River as Superintendent of the division between Spayten Dayvel and the Grand Central Station.

—Mr. J. B. Chapin, until recently Assistant Division Superintendent of the Boston & Albany, at Albany, N. Y., died in that city Jan. 19 at the age of 71. Mr. Chapin was nephew of the late Chester W. Chapin, and had been connected with the road nearly, or quite, a half century. His service during the first half of this period was chiefly as passenger conductor. Since 1866 he has been in the divisional headquarters at Albany.

—Lieutenant-Governor James H. McDonald, of Michigan, was killed in a derailment at Elmwood, in that state, on Saturday last. Mr. McDonald's home was at Escanaba. While working on a railroad in the Gogebic region several years ago he became convinced that there were rich deposits of iron there, and bought extensive tracts of land between Ironwood and Bessemer, which on the development of iron mining became immensely valuable, and made him a millionaire. The derailment, in which other persons were killed and a number injured, is said to have been caused by a broken truck.

—Mr. Charles L. Colby, who for ten years has been President of the Wisconsin Central Railroad Company, and who was also President of the Wisconsin Central Company, has resigned both offices. He is succeeded as President of the Wisconsin Central Railroad Company by his brother, Joseph L. Colby, of Milwaukee. Mr. Edwin H. Abbot succeeds him as President of the Wisconsin Central Company. Mr. Colby has also resigned from the Board of Directors of both companies. Mr. Colby has for more than a year contemplated taking a rest from active duties, and the present condition of the company's interests gives him the opportunity desired. In 1870 Mr. Colby became Treasurer of the Phillips & Colby Construction Co., builders of the Wisconsin Central, and he has since remained with the Wisconsin Central, serving as Vice-President for three years.

—I. H. Bromley will retire from the office of Assistant to the President of the Union Pacific on March 1. Mr. Bromley's duties in this position, which he has held for four years, have been chiefly in connection with the effort to procure a settlement of the questions between the company and the Government. It having been decided that no further effort in this direction will be made after the present Congress, the department heretofore in Mr. Bromley's charge will be discontinued.

In accepting Mr. Bromley's resignation, President Adams writes: "As you say, the work you came here to do is practically accomplished, so far as your part of it is concerned. We have not got a settlement with the government, nor are we likely to get one, but the tone of the press toward us has, largely through your exertions, been greatly moderated, and our case is fairly understood. Under these circumstances, I do not see any field for active work which remains for you here. It would be otherwise did I have any intention of entering on any wide effort at railroad reform calling for discussion through the press. I have no hope of being able to attempt anything of that sort in the short time left to me. I have wasted four years in futile attempt at an honest settlement, and have no more years to give to work which would, in those years, have been worth doing. It only remains for me to express my sense of the work you have done, and also to add that our personal intercourse during the years your desk has been within call of mine has been one of the somewhat few pleasant and refreshing episodes of my active railroad life."

**ELECTIONS AND APPOINTMENTS.**

**Baltimore & Harrisburg.**—The following were elected directors of the road at the recent annual meeting: President, Capt. A. W. Eichelberger; Directors, J. M. Hood, W. S. Rayner, C. W. Slagle, David Willis, Reuben Young, Stephen Keefer, W. H. Vickery, Jerome L. Boyer, Lewis P. Brocklev and R. M. Wirt.

**Baltimore & Ohio.**—Charles Frick has been appointed Fuel Agent, with headquarters at Cumberland, Md., vice E. T. Atkinson, deceased.

**Bellingham Bay Railway & Navigation Co.**—The names and addresses of the officers are: Eugene Canfield, President, Whatcom, Wash. Terr.; D. B. Jackson, First Vice-President, Fort Gamble; J. H. McGraw, Second Vice-President, Seattle, W. T.; C. M. Sheafe, General Manager, Seattle; Sutcliffe Baxter, Treasurer, Seattle; W. R. Forrest, Secretary, Seattle; Frank H. Richards, Superintendent, Whatcom.

**Berlin Branch.**—At the annual meeting held at Abbotstown, Pa., last week, the following were elected directors: President, Capt. A. W. Eichelberger; Directors, Jacob Reiser, A. W. Storm, W. T. Hildebrand, Jacob M. Smyser, R. N. Meisenholder, Daniel Eberly, Joseph Wolf, Henry A. Young and Robert M. Wirt.

**Buffalo, Rochester & Pittsburgh.**—John F. Dinkey, formerly Auditor and Assistant Treasurer, has been elected Treasurer in place of G. Macdonald, resigned. Office at Rochester, N. Y. J. H. Hocart is Secretary and Assistant Treasurer.

**Chattanooga, Rome & Columbus.**—A. McCollister has been appointed Assistant General Freight and Passenger Agent, with office at Rome, Ga.

A. McCollister has been appointed Assistant General Freight and Passenger Agent.

**Chesapeake & Ohio.**—E. S. Goodman has been made Division Freight Agent, with headquarters at Richmond, Va.

**Chester & Delaware.**—The directors elected at the recent annual meeting are: Austin Corbin, George de B. Keim, S. A. Caldwell, A. A. McLeod, A. J. Antelo, George F. Baer, William Ward; Secretary, Howard Hancock; Treasurer, John Welch.

**Cincinnati, Jackson & Mackinaw.**—J. B. Steele has resigned as General Road Master and the following appointments are announced: G. L. McKibben is made General Road Master and Chief Engineer of the Ohio and Michigan divisions, at Van Wert, O.; John Droody, for the Michigan Division, at Marshall, and John Hickey, for the Ohio Division, at Van Wert, are appointed Supervisors.

**Colorado & Northern Kansas.**—The directors of this new Kansas company are: Thomas W. Osborne, George E. Hubbard, of New York, and S. S. Webster, A. P. Morrison, J. A. Trautman, R. S. Cross and J. H. Dennis, of Topeka, Kan.

**Dexter & Piscataquis.**—The directors and officers of this road are as follows: Directors, J. B. Mayo, S. O. Brown, F. W. Hill, W. B. Bacon, J. S. Maxey, I. Johnson, G. A. Abbott, J. B. Peaks, Geo. Fisher, T. F. Dyer, D. R. Shaw. President, J. B. Mayo, of Fayette; S. P. Evans, Secretary, and E. A. Thompson, Treasurer.

**Erie & Pittsburgh.**—The stockholders of the company, at the recent annual meeting, elected directors as follows: G. B. Roberts, Philadelphia; S. T. Fairchild, Cazenovia, N. Y.; William L. Scott, Charles H. Strong, William Brewster, M. H. Taylor, and Joseph McCarter, of Erie, Pa. The directors elected W. L. Scott, President; Joseph McCarter, Vice-President, and William Brewster, Secretary and Treasurer.

**East Pennsylvania.**—Austin Corbin, George de B. Keim, S. A. Caldwell, A. A. McLeod, A. J. Antelo, George F. Baer, Thomas Hart, Jr., Beauveau Borie, and George D. Sutzler, were elected directors at the recent annual meeting; Secretary, Howard Hancock; Treasurer, John Welch.

**Evansville & Chattanooga.**—Laban M. Rice, John C. Gordon, C. Young, Albert S. Marks and J. E. Williams, of Evansville, Ind., are the incorporators of this Tennessee company.

**Holston.**—The incorporators are J. W. Fletcher, Sylvanus Howell, J. F. Preston, C. M. Puckett and J. K. Doran. All of them are from Knoxville, Tenn., and the general offices will be at that place.

**Indianapolis, Decatur & Western.**—R. L. Vansant has been appointed Chief Engineer.

**Jefferson & Columbiana.**—The officers of this new Ohio company are: W. B. Donaldson, President; Winfield Scott, Vice-President, and George A. Maxwell, Treasurer, all of Steubenville, O.

**Mexican International.**—W. N. Mackenzie, Traffic Agent, has been appointed General Freight and Passenger Agent, with office at city of Mexico.

**Mobile, Jackson & Kansas City.**—The officers of this Alabama company now are: F. A. Luling, of Jackson, Miss., President; H. Austill, of Mobile, Ala., Vice-President and General Manager; R. B. Owen, Secretary, and J. W. Nicol, Chief Engineer. The general offices are at Mobile.

**Montana Union.**—Robert Law has been appointed Superintendent, with headquarters at Butte, Mont., in place of G. W. Dickinson, resigned.

**New Jersey Junction.**—At a meeting of the directors this week Chauncey M. Depew was elected President; Andrew Green, Vice-President; and E. V. W. Rossiter, Secretary and Treasurer.

**New York Central & Hudson River.**—Henry W. Webb has been appointed Assistant to the President, in place of James Tillinghast, resigned. Mr. Webb is Vice-President of the Wagner Palace Car Co.

**New York, Chicago & St. Louis.**—G. W. Vaughan, Assistant Engineer, has been appointed Engineer of the Eastern Division, with office at Cleveland, O., to succeed Mr. A. W. Johnston, recently promoted to be Superintendent. The appointment takes effect Feb. 1.

**Pennsylvania.**—William Bedell has been appointed District Passenger Agent for the Pennsylvania lines, with headquarters at San Francisco, in place of J. B. Kirkland, resigned to accept service with the Union Pacific. Mr. Bedell will have charge of passenger matters pertaining to the Vandalia & Pennsylvania route, via St. Louis, and the Fort Wayne & Pennsylvania route, via Chicago on the Pacific coast.

**Philadelphia, Germantown & Norristown.**—At the recent annual meeting these directors were elected: W. W. Colket, C. Stuart Patterson, F. B. Gowen, E. H. Weil, W. S. Wilson, Lewis Elkin, C. Howard Colket, J. Sergeant Price, Charles

C. Sleifer, Samuel Y. Hebner, Eli Kirk Price and Charles Schaffer; Secretary and Treasurer, W. W. Stephens.

**Philadelphia & Reading.**—H. S. Bergerson has been appointed Traveling Freight Agent, with office at Williamsport. R. R. Gordon holds a similar position for the territory south of Tamaqua, except the Philadelphia & Chester Branch and the New Jersey lines, which are under J. F. Auch.

**Philadelphia, Wilmington & Baltimore.**—The stockholders of the road held their annual meeting last week and elected the following officers: President, George B. Roberts; Vice-President, Frank Thomson; Secretary and Treasurer, Robert Craven; Directors, Samuel M. Felton, William Sellers, George B. Roberts, Frank Thomson, J. N. du Barry, J. P. Green, Wistar Morris, Henry D. Welsh, Christian Febiger, E. Tattall Warner, Benjamin F. Newcomer, Shipworth Wilmer, German H. Hunt, Edward Lloyd, Jacob Tome.

**Pittsburgh Junction.**—At the annual meeting in Pittsburgh, Pa., this week the following directors were chosen: T. M. King, President; J. W. Chalfant, C. B. Herron, James Callery, Jacob Painter, Jr.; Reuben Miller, William Metcalf, W. L. Van Kirk, William Van Kirk, A. E. W. Painter, C. L. Fitzhugh, Charles F. Mayer and William F. Frick.

**Pittsburgh & Lake Erie.**—At the annual meeting of the company, held at Pittsburgh this week, the following officers were elected: President, John Newell, of Cleveland; Directors, Cornelius Vanderbilt, William K. Vanderbilt, F. W. Vanderbilt, H. McK. Twombly, and E. D. Worcester, of New York; M. W. Watson, Henry Hice, J. I. Bennett, James M. Bailey, J. H. Reed, J. M. Schoonmaker, and D. Leet Wilson, of Pittsburgh. The changes in the directory were F. W. Vanderbilt in place of D. H. Hostetter and E. D. Worcester in place of Herbert Dupuy.

The annual meeting was held in Pittsburgh Jan. 22. The only changes in the board of directors were the election of F. W. Vanderbilt in place of D. H. Hostetter and E. D. Worcester in place of H. Dupuy. John Newell was elected President and General Manager.

**Pittsburgh, McKeesport & Youghiogheny.**—At the annual election held this week the only change in the board of directors was the election of James M. Bailey, in place of the late D. H. Hostetter.

**Pittsburgh & Shenango Terminal Co.**—The incorporators of this Ohio company are George H. Kimball, William I. Bliss, Merton G. Woodbury, Adams B. L. Howard and Henry P. Jones.

**Pullman's Palace Car Co.**—Charles L. Pullman has been appointed Contracting Agent of the Manufacturing Department, with headquarters in Pullman Building, Chicago.

**Riverfront.**—Directors have been elected as follows: J. N. DuBarry, G. B. Roberts, Wistar Morris, N. P. Shortridge, Henry D. Welsh, Frank Thomson, John F. Green, H. H. Houston and Amos R. Little.

**Rockland, Rockport & Camden.**—P. J. Carlton, of Rockport, Me., is President, and O. H. Tripp, of Rockland, Me., is Chief Engineer of the road.

**Rome & Decatur.**—At the annual meeting held in Rome, Ga., Jan. 15, the following directors and officers were elected: Directors: Eugene Kelly, John Ryme, S. F. Austin, John S. Silvie, F. S. Smith, C. Weidenfeld, Charles J. Townsend, C. M. Fry, of New York; Jno. C. Printup, J. H. Reynolds, T. F. Howel, of Rome, Ga., and R. B. Kyle, of Gadsden, Ala. Officers: Eugene Kelly, President; John Ryme, Vice-President; Stephen F. Austin, Treasurer; F. M. Barnum, Secretary, and F. S. Smith, General Counsel. The road is operated by Judge R. T. Dorsey, of Atlanta, Ga., as Receiver, with R. A. Bacon as Superintendent for Receiver. General offices, Rome, Ga.

**St. Joseph & Grand Island.**—C. A. Fleming has been appointed Assistant General Freight and Passenger Agent, with office at St. Joseph, Mo. Mr. Fleming has been for some time Master of Transportation of the same road. William Williams, General Roadmaster, has been appointed acting Master of Transportation, but will continue his duties as General Roadmaster.

**St. Louis, Alton & Springfield.**—W. H. Bird has been appointed Auditor, with headquarters at Springfield, Ill.

**St. Louis, Arkansas & Texas.**—D. K. Ferguson, Henry C. Haarstick and S. B. Elkins have been elected directors, to fill vacancies. S. B. Elkins was chosen Second Vice-President.

**Salem, Tillamook & Astoria.**—John G. Wright, J. W. Maxwell, B. S. Cook, G. Wright, I. A. Manning, W. F. Boothby and others, of Salem, Or., are incorporators of this Oregon company.

**Salt Lake, Nevada & California.**—J. E. Fulton, R. A. McCormick, T. W. Bates, Theodore Brough, R. Gardiner, F. H. Nelden, H. C. McDonough, F. W. Montgomery, S. T. Thompson and George W. Ellison are the incorporators of this Utah company. The following are directors for the ensuing year: James E. Fulton, Treasurer; Thomas W. Bates, T. Brough, Robert Gardiner.

**Schuylkill & Lehigh.**—The officers of this new road are: E. N. Frisby, of New York, President; James A. Thurston, of the American Loan & Trust Co., New York, Treasurer. Among the board of directors are: Ex-Governor Cornell, General James S. Negley, of Pittsburgh; N. N. Betz, Towanda, and J. Raymond Claghorn, Philadelphia.

**Shamokin, Sunbury & Lewisburg.**—The following have been elected directors: S. P. Wolverton, A. H. Dill, John C. Smith, Levi Rooke, H. E. Davis, Henry Clement, John Haas, L. H. Kase; Secretary, Howard Hancock; Treasurer, John Welch.

**Sturgis, Deadwood & Bald Mountain.**—The incorporators of this Dakota company are: W. B. Rice, of Boston; Edmund Seymour, of St. Albans, Vt.; F. T. Evans, of Sioux City; J. W. Andrews, J. J. Davenport, J. T. Potter and F. M. Allen, of Sturgis, Dak.

**Terre Haute & Peoria.**—The stockholders at the annual meeting last week elected C. W. Fairbanks, of Indianapolis; W. G. Beale, of Chicago, and D. H. Conklin, of Decatur, directors for two years. The other directors are: C. O. Chestnut, of Paris, and John Bunn, of Springfield. The officers chosen were: C. W. Fairbanks, President; D. H. Conklin, Vice-President, General Manager and Treasurer; Andrew Stevens, Decatur, Secretary; G. W. Ditttridge, New York, Assistant Secretary; Andrew Stevens, General Freight and Ticket Agent; W. M. Strange, Auditor; E. A. West, Cashier.

**Tipton.**—The following directors have been elected: J. W. DuBarry, John P. Green, N. P. Shortridge, Henry D. Welsh, G. B. Roberts, W. D. Elkins and Amos R. Little.



**Titusville, Cambridge & Lake Erie.**—A. H. Steel is President and F. P. James is Chief Engineer of this road, with office at Titusville, Pa.

**Toledo, Peoria & Western.**—D. Mowat has been appointed Assistant General Freight Agent of the road.

**Trinidad & Salt Lake.**—G. Horn, Caldwell Tearman, John A. Lindsay, James A. Pearce and Dan A. Noble are the incorporators of this Colorado company.

**Union Pacific.**—S. W. Eccles has been appointed General Agent of the freight department of the Union Pacific & Oregon Railway & Navigation Co. for California and Nevada, west of Winnemucca. J. B. Kirkland has been appointed General Agent of the passenger department for the same territory.

**West Virginia Central.**—At the annual meeting this week the following were re-elected directors: H. G. Davis, Stephen B. Elkins, William Pinckney White, J. N. Camden, John A. Hambleton, Thomas B. Davis, John S. Gilman, W. W. Taylor and W. H. Gorman. The only change made in the directory was the election of Alexander Shaw in place of William H. Barnum, who declined a re-election. Henry G. Davis was re-elected President and S. B. Elkins Vice-President.

**Wrightsville & Tennille.**—At the annual meeting of stockholders, held on Jan. 14, the following directors were elected: W. B. Thomas, W. S. Ramsay, T. B. Felder, Jr.; A. F. Daley, G. B. Harrison, R. L. Warthen, O. H. Rogers, Edward McIntyre and J. S. Wood. At a meeting of the new board, the following officers were re-elected: W. B. Thomas, President and Superintendent; W. C. Matthews, Secretary and Treasurer, and F. H. Roberson, Auditor.

#### OLD AND NEW ROADS.

**New Companies Organized.**—Holston.—Jefferson & Columbiana.—Luverne, Andalusia & Pensacola.—Salt Lake, Nevada & California.—Salt Lake & Trinidad.

**Argentine Republic.**—Final arrangements have been nearly completed for building a transcontinental railroad from Buenos Ayres across the country to the Pacific Coast in Chili. The line will reach the Pacific Coast over a short road in Chili, already constructed. The railroad will be about 900 miles long. Four tunnels are to be dug through the mountains, but the greater part of the road will run through a prairie country. The governments of Chili and Argentine Republic guarantee an interest of 5 per cent. on \$34,000,000 from the time the first 50 kilometres of the road are laid to the completion of the whole line. The stock of \$37,000,000 is nearly all guaranteed, partly by English banking houses and partly by a number of well known New York firms. The New York Construction Co. has been organized to build the road. Perkins and Mott, of New York, have the concession for the road.

**Astoria & South Coast.**—The company has let the contract for grading a 10-mile section of the road from Skipanon, near Astoria, Or., south toward Seaside House and Tillamook Bay. A company is being formed in Albany to continue the road from Tillamook Bay south toward the Willamette Valley.

**Berlin & Canadian Pacific Junction.**—This company is applying for an extension of time for the commencement of construction of its road for a period of three years beyond that allowed in the charter, and to substitute Galt station for Dumfries station wherever the latter is mentioned in the act of incorporation.

**Brandon, Souris City & Rock Lake.**—This company is seeking an act of incorporation to enable it to construct a line of railroad from Brandon, Man., through Souris City, and in a southerly direction towards Rock Lake, thence southerly to the international boundary.

**Canadian Pacific.**—Power is asked by this company to issue bonds in aid of the acquisition of steam vessels to run in connection with the company's railroad.

Thompson & Co., Windsor, Ont., have been awarded the contract for all material required in the construction of the road from London to Windsor, Ont.

**Centralia & Ste. Genevieve.**—The projectors of this line have for several months been endeavoring to secure the right of way into Sparta, Ill. It is stated that arrangements have now been made by which the company secures an entrance to the city. Considerable work on the line has already been done. H. W. Schmidt, of Sparta, Ill., is Chief Engineer.

**Chattanooga & Lookout Mountain.**—The line is now completed to the top of Lookout Mountain, near the battlefield, a distance of 10½ miles from Chattanooga, Tenn.

**Chattanooga Southern.**—Active work will soon begin on the first ten miles of this road, which is to extend from Chattanooga, Tenn., to Alpine, Ala. Thus far the little work done has been under the immediate direction of the company, but contracts will be let in the spring for some of the work. J. C. Henderson, Chattanooga, is General Manager.

**Chesapeake & Ohio.**—The company has filed in West Virginia a mortgage to the Central Mortgage Company of New York. It is for \$30,000,000, and is on the property of the road from Newport News, Va., to the connection with the Elizabeth, Lexington & Big Sandy, also on the line from Ashland, Ky., to Covington, Ky.; and on the bridge between Covington, Ky., and Cincinnati, O.

**Cincinnati & Green River.**—The road will on Jan. 28 be sold to the highest bidder at public auction at Liberty, Casey County, Ky., by virtue of a decree of the Circuit Court. The road is now in the possession of the Receiver, and extends from King's Mountain, Lincoln County, Ky., to Yosemite, Casey County, Ky., about twelve miles.

**Colorado & Northern Kansas.**—Incorporated in Kansas to build a road from the northern line of the state through Marshall, Washington, Republic and other counties to the western line of the state. Chief offices are at Topeka, Concordia, Lincoln and Marysville. The capital stock is \$10,000,000.

**Cornwall & Lebanon.**—Three surveys for a line from Lebanon to Reading parallel to the Philadelphia & Reading have been made, but are not wholly satisfactory, and the surveyors will run a line from Cornwall to Mount Hope and Lancaster, again paralleling the Reading road.

**Detroit, Lansing & Northern.**—McRae, Lally & Son, contractors, of Detroit, Mich., have begun a suit against the Grand Rapids, Lansing & Detroit Co., an extension of this road, for \$500,000, claiming that the 70 miles of road they contracted to build were not designated promptly, the work, therefore, having to be done in the winter, entailed additional expense.

**Durham & Northern.**—Nearly all the tracklaying on this road is now completed, and it is expected to be opened for

traffic Feb. 1. The line extends from Durham via Creedmoor, to Henderson, N. C., a distance of 43 miles. The road connects at Durham with the Richmond & Danville, and at Henderson with the Raleigh & Gaston. It will form part of the Seaboard Air Line system.

**Evansville & Chattanooga.**—The company has applied for a charter in Tennessee, authorizing the building of a road from Evansville, Ind., to Chattanooga, Tenn. The incorporators of the company are also incorporators of the Kentucky & Tennessee Construction Co., recently organized at Evansville.

**Flint & Pere Marquette.**—The stockholders will hold a meeting next week to formally ratify the agreement to consolidate with the Flint & Pere Marquette, the East Saginaw & St. Clair, the Saginaw & Mount Pleasant, the Saginaw & Claire County and the Manistee. The consolidation is merely a formal matter, and the capital stock or bonded indebtedness of this road will not be affected. These roads are now in reality controlled by the Flint & Pere Marquette interest through the ownership of a majority of the stock of each. The injunction obtained by parties in New York restraining the consolidation of the Port Huron & Northwestern with the Flint & Pere Marquette is still in existence, but it is thought that it may be dissolved before long.

**Freehold & New York.**—The contract for building the Keyport road, an extension of this line from Keyport, N. J., to the Lorillard brick works, 2½ miles, has been let to T. C. O'Reilly, of Orange, N. J., and the work will be completed next March or April.

**Geneva, Ithaca & Sayre.**—In connection with the foreclosure proceedings of the Lehigh Valley against this road, judgment has been entered in the Chemung County Clerk's office for \$197,000, being the amount of a mortgage and interest overdue and now pressed for settlement by the Lehigh Valley.

**Hartford & Connecticut Western.**—A new passenger station will soon be built for the road at Hartford, at the corner of Church and Spruce streets. The plans for the new union station have, until recently, been involved in controversy, and it was uncertain how this road would fare; but it is now certain that the tracks of the New York & New England road cannot be used. Plans have already been prepared, and work will begin as soon as the weather permits.

**Holston.**—This company has been organized at Knoxville, Tenn., for the purpose of building and operating a line of road from Knoxville to a point at or near Boyd's Ferry, in Knox County, Tenn., on the Holston River, a distance of less than 50 miles. Preliminary surveys will be made some time in February.

**Hamilton Central.**—This company is applying to Parliament for an act continuing the powers granted by the act authorizing the construction of its railroad.

**Illinois Central.**—The company reduced its dividend rate this week from 7 to 5 per cent. a year, by declaring a semi-annual dividend of 2½ per cent. There was the usual 3½ per cent. for the first half of the fiscal year. The 2½ per cent. dividend declared this week, though establishing the 5 per cent. a year basis, makes really 6 per cent. paid for the year.

**Indianapolis, Decatur & Western.**—T. S. Martin, Civil Engineer, and a party of surveyors, have begun the survey for the western extension of the road from Decatur and Beardstown, Ill., starting in a northwesterly direction from Decatur.

**Interoceanic.**—Read, Campbell & Co., of London and the City of Mexico, who have the contract for the grading, tracklaying, bridging, ballasting, etc., on the first 84 kilometres of the road, have 2,000 men at work, and will soon increase the force to 10,000 men. As soon as this contract is finished they will take another large one. The firm has the contract for the location of the entire line, and have now five parties of engineers completing the location of the line to Vera Cruz. It is expected to have the line from the City of Mexico to Perote opened in March. Between Perote and Rinconada there will be very heavy work. John Early is Chief Locating Engineer.

**Isthmus of Tehuantepec.**—This road is now being surveyed across the Isthmus of Tehuantepec by Read, Campbell & Co., of the city of Mexico, and the contract for building it will be let in about six months. The road is to extend from a point on the Pacific Ocean, near Tehuantepec, to a point on the Gulf of Mexico, and will be 300 kilometres long. The Mexican government guarantees \$13,000,000 in gold at 5 per cent., for 15 years after the completion of the road.

**Jefferson & Columbiana.**—Incorporated in Ohio to build a road from Portland to Steubenville, 15 miles. The Steubenville Construction Co. has been organized to build it. It is stated that the line is in the interest of the Wheeling & Lake Erie.

**Kansas City, El Paso & Texas.**—It is stated that all claims against this company will soon be paid, and that work on the road will be commenced again near El Paso, Tex., where tracklaying was suspended a short time ago on account of non-payment of several judgments which had been obtained against the road.

**Keokuk & Northwestern.**—Judge Love in the Federal Court at Keokuk, Ia., signed a decree last week foreclosing the first mortgage on this road, the principal of which is \$480,000. The road, which extends from Keokuk to Mt. Pleasant, Ia., 48 miles, is leased and practically owned by the St. Louis, Keokuk & Northwestern, which is itself controlled by the Chicago, Burlington & Quincy.

**Kingston & Pembroke.**—This company is applying for an extension of time for the completion of its main line and branches.

**Kingston, Smith's Falls & Ottawa.**—This company is applying for an extension of time for the completion of its road; also for power to construct branch lines to the village of Lanark, Ont., and to acquire and work mining property in the counties of Lanark, Leeds and Carleton.

**Knoxville & Ohio.**—The special meeting of the stockholders held in Knoxville this week ratified the lease of the property for 99 years to the East Tennessee, Virginia & Georgia, which latter company has agreed to guarantee the first mortgage 6 per cent. bonds of the Knoxville & Ohio.

**Lehigh Valley.**—The company has decided to abandon the Morris canal. No boats will be run upon it after this year, and probably none will be started out this year. Its coal traffic has fallen to about 50,000 tons a year, the tolls upon which are not sufficient to pay the cost of keeping the canal open. The canal's terminals at Jersey City are needed by the road for its piers and buildings now being erected, and arrangements are nearly completed for supplying the city of Newark with water from the canal, which is fed from Lake Hopatcong and Greenwood Lake. Asa Packer leased the canal to afford the Lehigh Valley an outlet to New York harbor. With the construction of the Easton & Amboy road (the New Jersey division of the Lehigh Valley), however, the importance of the canal declined, and it has ever since been operated at a loss.

**Leroy, Topeka & Northern.**—S. A. Mitchell has just completed a survey for the road from Topeka through Shawnee, Osage and Coffee counties to Leroy, Kan., a distance of 75 miles.

**Luverne, Andalusia & Pensacola.**—Charter filed in Alabama to build a road from Luverne, Ala., to Pensacola, Fla., by Joseph S. Prestwood, John F. Thomas, T. W. Strauagn, E. J. Mancell and others of Covington County, Ala.

**Manitoba & Southeastern.**—An act of incorporation is asked by this company to construct a line of railroad from Winnipeg to a point on the international boundary east of Red River, with branch lines from the towns of Morris and Silkkirk, Man.

**Massachusetts Junction.**—An application has been made by this company to extend the time for commencing construction and for additional power to extend its line from Agers Flats to a junction with the Hereford Branch in Hereford or Auckland, Que.

**Mexican Central.**—It is reported that a syndicate of London capitalists has been formed to take up the bonded indebtedness of the road.

**Mexican Southern.**—The surveys on this road are making rapid progress. Read, Campbell & Co., of the City of Mexico, are the promoters of the road, and will do the grading, tracklaying, etc., and furnish the rolling stock. The line is to extend south from the City of Mexico, and pass through La Puebla and Oajaca to a point on the Pacific Coast near the southern end of the proposed Isthmus of Tehuantepec road. It will be about 800 kilometres long, and will be narrow gauge, extending the narrow gauge system south to the Isthmus of Tehuantepec. The Mexican Government guarantees an interest of 8 per cent. for 15 years on the capital stock, if the line is completed in seven years. The road will connect with the Mexico & Vera Cruz and the Inter-oceanic roads. The maximum grade for 150 kilometres, between Oaxaca & Domingillo is 3 per cent. The line between these places will be through a cañon, and the work will be very heavy. Most of the material of the road will come from Europe, but the locomotives, and possibly the cars, will come from this country. The route traversed is through a rich mineral and farming country.

**Mobile, Jackson & Kansas City.**—Engineers are now locating the first 170 miles of this road from Mobile, Ala., to Jackson, Miss. The line in Mississippi will run up the south bank of the Leaf River. The line from Mobile will be over the old road of the Mobile & Northwestern for 15 or 20 miles. This is the roughest part of the route, but is now almost ready for the rails. This part of the line will be completed soon. Estimates for this work are now being made. The location for the line will be completed early next summer, and the company expects to then be able to let contracts. The country through which the line will be located admits of easy location. There will be easy grades, long tangents and few stream crossings. The stock has been nearly all subscribed in Mobile, Hattiesburg, Jackson and Kansas City.

The engineer corps in charge of M. B. Bond is running a line from Mobile over the old Mobile & Northeastern Route, striking Pascagoula River about 12 miles below the junction of the Leaf and Chickasaw River, thence along the south bank of the Leaf River to Hattiesburg, Miss.

**Montgomery & Sylacauga.**—It is expected to commence the survey for this road from Montgomery, Ala., to Sylacauga next week, and it is stated that contracts will be let about April. No permanent organization has yet been effected, but it is stated that arrangements have been nearly completed for floating an issue of bonds. B. D. Collier, of Montgomery, is President.

**Newark, Somerset & Straitsville.**—Suit has been filed in the Common Pleas Court at Columbus, O., by several holders of stock in the road, against the Baltimore & Ohio and the Newark, Somerset & Straitsville, asking that a receiver be appointed for the last named road, and that an account be rendered every six months. The petition alleges that the Baltimore & Ohio leased the road in January, 1872, and in 1875 purchased a majority of stock and changed the directors, and failed to comply with the terms of the lease. The road extends from Newark to Shawnee, O., 44 miles.

**New Brunswick & Prince Edward Island.**—This company is applying for power to extend its line from its junction with the Intercolonial at Sackville, N. B., to Wood Point, and to a deep water terminus on the Bay of Fundy.

**New Roads.**—Among the several railroad companies which will apply for acts of incorporation during the approaching session of the Canadian Parliament, but whose names have not yet been designated, is a company having for its object the construction of a road from a point on the Fraser River, in New Westminster, B. C., to a point on the international boundary line, near Semiahmoo Bay.

Application is also made for power to construct a line of railroad from a point on the Canadian Pacific, near Shelley Station, to a point at or near White Mud Lake, on the Winnipeg River. Also for power to construct a line from the town of Durham, Ont., to the town of Meaford. Also for power to construct a line from Victoria, B. C., to some point at or near Shoal Harbor and Swartz Bay, North Saanich, Vancouver Island, connecting by ferry communication to various points; also for power to construct lines from points on the main land to Vancouver and New Westminster and to the international boundary, to connect with the Canadian Pacific and with the railroad system of the United States. A company having for its object the construction of a railroad from the city of Ottawa, passing through the towns of Metcalf, Vernon, Ormond, New Winchester, North Williamsburgh and Morrisburgh to a point on the River St. Lawrence at or near Morrisburgh, with power to construct a bridge across the St. Lawrence to a point in the State of New York, to connect with a projected line of railroad in that state. Power for the construction of a bridge across the Ottawa River, at the city of Ottawa, to a point in the Province of Quebec immediately opposite the latter city. Application is also made by a company for power to construct a road from a point on the Kootenai River contiguous to the Tond Mountain District, British Columbia, thence northerly along the west shore of Kootenai Lake and valley of the Columbia River to the Boat Encampment.

H. A. Hancock, of Hudson, Mass., will, it is said, make a new survey from South Sudbury, Mass., to Worcester, a distance of 18 miles. A line was surveyed between these points in 1872, and a road over it connecting with the Central Massachusetts at its eastern end would make a through line from Worcester to Boston slightly shorter than the Boston & Albany.

**New Westminster, Bellingham Bay & Seattle.**—The contract will be let immediately for clearing and grading this road from Whatcom, W. T., north toward the international line for a distance of 17 miles. The clearing on the line south from New Westminster, which was let last fall to James Cleary, of New Westminster, B. C., is now



nearly completed, and about Feb. 1 grading will begin on this end of the line, and it is expected that it will be completed ready for operation next July. C. M. Sheafe, of Seattle, is General Manager.

**Niagara & Grand Island Bridge Co.**—An extension of time for the commencement and completion of this work is asked for.

**Norfolk & Western.**—The contract to build the extension of the Cripple Creek branch of the road from Ivanhoe Furnace to Speedwell, Va., about 15 miles, has been let to George T. Mills, of Pulaski, Va.

**Northern Pacific.**—It is stated that the proposed line of railroad from a point on the Ottawa River to Quebec is to form part of the scheme by which the Northern Pacific will reach the Atlantic seaboard through Canada. The parties interested in the line from a point on the Ottawa River to Quebec are also applying to the Ontario Legislature for a charter to build a railroad from Sault Ste. Marie to join the former road.

**Norwich & Worcester.**—The report that this company's freight track from Norwich to Allyn's Point, Conn., is to be extended southward to Groton, opposite New London, is again published. As the bridge now building between Groton and New London will give an entrance to the latter city independent of the New London Northern, whose track this road now uses, the truth of the report seems more probable than before.

**Ohio & Northwestern.**—A large crowd of people greeted the first standard gauge train on the old Columbus & Mayville narrow-gauge, which arrived at Hillsboro, O., Jan. 16. The road changed is 19 miles long.

**Ontario, Manitoba & Western.**—An act of incorporation is asked by this company to construct a road from Port Arthur, Ont., westerly to Winnipeg, crossing the narrows of the Lake of the Woods, and south of the line of the Canadian Pacific. Also for power to construct branch lines westerly from Winnipeg through Manitoba and Northwest territories.

**Oregon Pacific.**—Work has been suspended on the extension of the road eastward for the winter, and the men paid off and discharged. The track is now laid five miles east of Bad Banks, about 60 miles east of Albany. It is stated that work will be resumed early in the spring and the road pushed vigorously.

**Ottawa & Vandeventer.**—The Grand Trunk has announced its intention of aiding this company, and work of construction will be commenced early this spring. The road will form part of the Grand Trunk system, as it has no independent connection with Ottawa at present. It is understood that this road, which shortens the distance to Montreal 8 miles over competing lines, will be extended west to form part of the Midland system of the Grand Trunk, thus forming a loop line which will relieve the main line of the Grand Trunk of the heavy traffic between Toronto and Montreal.

**Paris, Choctaw & Little Rock.**—The locating survey for this road has been completed from Paris, Tex., to the Red River, near the mouth of Rionatua River, a distance of 30 miles. It is expected to begin work at Paris soon, and continue it to the Arkansas state line and thence toward Hot Springs, Ark. S. J. Wright, of Paris, Tex., is President.

**Penobscot & Memphis.**—The act granting the right of way to the company through public lands in Florida, Alabama, Mississippi and Tennessee has become a law without the President's signature.

**Philadelphia & Reading.**—The new route by which freight trains will go around the city of Reading instead of passing through on Seventh street has been determined upon. A new branch will be built from a point about two miles above the city, which will connect with the West Reading road, which runs along the river front, and from thence on to the line at present used by the Wilmington & Northern, but controlled by the Reading. The line of the latter will be followed to a point about two miles below the city, from whence a connecting link will be built across the river near Neversink.

**Pittsburgh & Lake Erie.**—At the annual meeting, held in Pittsburgh, the resolution to increase the capital stock from \$2,500,000 to \$4,000,000, and to increase the bonded indebtedness from \$2,000,000 to \$4,000,000, was passed. The report for 1888 showed an increase in net earnings over the previous year of \$109,690. The surplus, after deducting interest amounting to \$211,197, was \$188,801, from which two dividends of 3 per cent. each were paid, the dividend amounting to \$123,000.

It is reported that the stock held by the estate of Dr. David Hostetter, an original promoter of the road, has been sold to the Vanderbilts.

**Pittsburgh, Shenango & Lake Erie.**—The application of the Attorney-General of Pennsylvania for an injunction against the company, restraining it from issuing certain stock, has been dissolved and the suit dismissed.

**Plymouth & Sandwich.**—A reconnaissance will be at once begun, preliminary to applying for an act of incorporation of this company at the present session of the Massachusetts Legislature. It is reported that about \$100,000 of the stock has already been pledged, and that Taylor Bros., Moses Williams and others, of Boston, are the principal projectors and subscribers to the stock. The route will be from Plymouth through South Plymouth or Manomet, Peaked Cliffs, Big and Little Herring Pond, Cedarville, to a point on the Cape Cod division of the Old Colony between Bourne and Sagamore, a distance of 16 miles. The probable cost is \$250,000. The road will be constructed by an independent company, but it is believed that the Old Colony company will equip and operate it.

**Pomona & Elsinore.**—The negotiations which were pending between this company and the Southern Pacific, for the transfer of the charter, rights of way, etc., of the line to the latter company, have been dropped. The road was to extend from Pomona to Elsinore, Cal., about 42 miles, and of this 30 miles have been graded.

**Pontiac & Pacific Junction.**—This company is applying for an extension of time for the completion of the road to the town of Pembroke, Ont.

**Roanoke & Craig.**—The contract has been let to the Sears Construction Co., of Chattanooga, Tenn., for building this road from Roanoke, Va., to Eagle Rock, via Newcastle, Va., a distance of 48 miles. J. W. Marshall is President.

**Roanoke & Southern.**—The contract for building the road from the Virginia state line south to Walnut Cove, N. C., about 29 miles, has been let to the Construction Co., of which T. H. Fries, of Salem, N. C., is President. All the sections of the line from Winston, N. C., north to Martinsville, Va., are now either under contract or completed.

**St. Louis, Alton & Springfield.**—The new extension of the road from Newberne to Alton, Ill., 15 miles, was

opened for traffic last week. The line reaches East St. Louis over the tracks of the Indianapolis & St. Louis.

**St. Louis, Arkansas & Texas.**—The Delta and Malden extension of this line, which gives the road a terminus 50 miles nearer St. Louis than theretofore, will be in operation within a fortnight. The tracks of the St. Louis, Iron Mountain & Southern are used from Malden to St. Louis.

**Salem, Tillamook & Astoria.**—Incorporated in Oregon, with a capital stock of \$100,000, to build a road from Salem, via Tillamook, to Astoria, Or. The principal office will be at Salem.

**Salt Lake, Nevada & California.**—Articles of incorporation of this company have been filed in Utah to build a road from a point on the Denver & Rio Grande Western, at or near Salt Lake City, and extend west via Garfield Beach to Grantsdale, thence northwesterly to Salt Springs, and from that point southwesterly to Deep Creek, a total distance of 150 miles. The capital stock is \$5,700,000. One thousand dollars per mile has been subscribed and 10 per cent. paid in. It is estimated that the entire road will cost \$2,800,000. It is expected to complete the road from Salt Lake City to Garfield Beach by next July.

**Savannah, Griffin & North Alabama.**—The suit brought by the minority stockholders of the company against the Central of Georgia, which is owner of a majority of the capital stock of the Savannah, Griffin & North Alabama, was this week decided by the Supreme Court of Georgia in favor of the Central of Georgia.

The suit was brought to have declared the ownership of this stock by the Central of Georgia as illegal, and had been decided by the lower court against the latter company. The lower court granted an injunction and appointed a Receiver. The Supreme Court reverses the judgment of the court below, and rules that the contesting stockholders have no case.

**Schuylkill & Lehigh.**—It is stated that surveys are now being made for this proposed Pennsylvania road, and that work will be commenced early in the spring. The road is to run from the western end of Schuylkill County through New Ringgold, Orwigsburg, Schuylkill Haven, Cressona and Tremont, thence to the Lehigh Valley road, in whose interest the road will be built. The road will be 60 miles long.

**Sheffield & Birmingham Coal, Iron & Railway Co.**—This company has been placed in the hands of a receiver, at Sheffield, Ala. It was formed in August, 1887, by the consolidation of the Alabama & Tennessee Coal & Iron Company and the Sheffield & Birmingham Railroad Company. The complications growing out of that consolidation, and the inability of the company to float its securities at a fair price, made a receiver necessary. Mr. J. G. Chamberlain, of Sheffield, Ala., has been appointed Receiver.

**South Pennsylvania.**—It is stated that the trouble with the Pittsburgh stockholders of the road has been settled, and that all of them, but H. C. Frick, have signed the Carnegie agreement, and that he will sign with the Vanderbilts early next week. A meeting to make arrangements for starting work on the road will be held in Pittsburgh next week. A Philadelphia paper states that the reorganization plan contemplates the issue of \$10,000,000 six per cent. first mortgage 50-year gold bonds, \$3,000,000 preferred stock and \$7,000,000 common stock. When work was stopped the cost had been \$5,500,000, which with interest makes the amount about \$7,000,000; 20 per cent., is to be called at once on subscriptions, and preferred stock given for it. The bonds will be offered pro rata to stockholders.

**Sturgis, Deadwood & Bald Mountain.**—Charter filed in Dakota to build a road from Sturgis to Galena and Brownsville, with a branch line to Deadwood.

**Sturgis, Indiana & Ohio.**—The company has been organized at Sturgis, Mich., to build a road from South Haven, Mich., to Columbus, O. It will be an extension of the Columbus, Lima & Northwestern, and will connect with the latter at Bryan, O. The contract is now let for work from Columbus to Defiance, and a construction company is ready to take this part of the road.

**Syracuse & Baldwinsville.**—Foreclosure proceedings have been begun by the Central Trust Co., of New York, against the company for the purpose of foreclosing a mortgage for \$160,000 that the plaintiff holds as trustee for holders of the bonds, the proceeds of which were used in the construction of the road. The bonds are first-mortgage 50-year 6 per cent., and were issued July, 1886, the road being opened the following January from Syracuse to Baldwinsville, N. Y., 6 miles. Default was made Jan. 1.

**Tennessee Midland.**—The road has completed track-laying from Jackson, Tenn., east for about 18 miles, and work is progressing toward the Tennessee River, a distance east of Memphis of 135 miles.

The Mayor and Board of Aldermen of Jackson, Tenn., last week unanimously passed an ordinance issuing bonds to the value of \$125,000 to this company.

**Titusville, Cambridge & Lake Erie.**—The grading and masonry work on this road between Enterprise and Cambridge, Pa., is completed. The road is projected in the interest of the new York, Lake Erie & Western, and is to extend from Pleasantville, Venango County, Pa., through Enterprise, Titusville and Cambridge to Erie, Pa., a distance of 65 miles.

**Trinidad & Salt Lake.**—The company has been incorporated in Colorado, with a capital stock of \$100,000, to build a road from Trinidad to Mesa. It is reported that 250 men are at work on the road about 20 miles west of Trinidad.

**Union.**—This company has been chartered in Pennsylvania to build a road five miles long, extending from a point on the Edgar Thomson Steel Works, in the village of Bessemer, crossing the Monongahela River and passing through Homestead to a point on the Hays estate in Mifflin township, Allegheny County. The capital stock is \$50,000.

**Union Palace Car Co.**—This company, formed a few months ago, by parties controlling the Mann and Woodruff companies, and which had secured the contract for operating the sleeping car service of the Richmond & Danville, has been merged in the Pullman Co., the latter thereby gaining control of all important lines in the country, except those of the Wagner Palace Car Co., operating over the New York Central and allied lines.

**Wabash.**—The Masters in Chancery in the Wabash case will soon meet in Chicago to prepare their final report to the court. The report will be filed shortly thereafter, and then the Reorganization Committee will move for a speedy decree. It is thought that early in February the court will order the sale of the main line and St. Louis divisions. A decree is now being prepared to sell the Chicago Division and take it out of the Receiver's hands, with a view to speedy reorganization.

**West Shore.**—A Cassidy, the Referee in the foreclosure suits of this road, has been finally discharged. In his report the Referee showed that he had \$29,929 on hand. The Court directed him to pay this balance to the Union Trust Co. of New York, to await decision in suits now pending, to pay dividends and percentages on 39 bonds of the company now outstanding, to pay the railroad and Receivers' vouchers and surplus arising on interest, to file receipts and vouchers in the County Clerk's office, and on filing such the discharge to take effect.

**Wood Mountain & Qu'Appelle.**—This company is applying for an extension of time for constructing its road, and for an act more clearly defining the direction in which the road is to run from the international boundary line westward.

## TRAFFIC AND EARNINGS.

### Traffic Notes.

Trains 2 and 3 of the Central Pacific have been taken off, leaving only one through passenger train each way daily, except on the days the Golden Gate Special runs.

On complaint of Kingman & Co. against the Chicago & Alton, the Railroad and Warehouse Commissioners of Illinois have decided that the selling of 2,000 mile tickets at \$40, when for 1,000-mile tickets \$25 is asked, is contrary to law in the direction of giving the larger patron an undue advantage over the smaller.

The Kansas City, Memphis & Birmingham has put on a free reclining chair car between Memphis and Birmingham. This is said to be the first instance of the kind in the Southern states.

There is much excitement in St. Louis over an advance in the freight rate on corn from western points to that city, which is said to have been ordered by the Union Pacific. The roads have by agreement hitherto carried corn to St. Louis for 5 cents less per 100 lbs. than to Chicago. This differential will be reduced, it is said, to 3 cents, the first move being made by the Union Pacific. The action of the Missouri Pacific and the Burlington seems to be as yet in doubt.

According to a circular just issued by Vice-Chairman Daniels there are now 230 lines that have approved of the plan of issuing passenger rate sheets quarterly. He also gives a list of 72 joint passenger rate sheets in which every line interested has voted to give it a trial. This includes about all the joint rate sheets in the country.

The Inter-state Commerce Commissioners are going to Chicago next week to investigate ticket scalping, and the rates on hogs and provisions from Missouri River points.

### Trunk Line Presidents.

At a meeting of the presidents of the trunk lines in New York, Jan. 22, all lines except the New York, Ontario & Western being represented, the following resolutions were adopted:

Resolved, First, That the Trunk Line Board of Presidents recognize in the agreement of the Western presidents the principles already included, in the main, in the trunk line agreement, and that the former be referred to the commissioner to report to the Board of Presidents what modifications, if any, are necessary or seem advisable in the existing trunk line agreement; the commissioner to have the power to call together the executive committee from time to time for consultation.

Second, That the report include a provision embodying rules under which reports shall be made to the Inter-state Commerce Commission of willful violations of the law.

Third, That the principle of arbitration be, if necessary, more distinctly and clearly reaffirmed.

Fourth, That provision be made, as far as the same can lawfully be done, to guard against any road in this association being used by connecting lines in violation of the spirit of the trunk line agreement.

### Southern Vegetable Traffic.

General Freight Agent R. X. Ryan, of the Cincinnati, New Orleans & Texas Pacific (Queen and Crescent System), has issued a circular to the farmers in the territory tributary to his line in the extreme South, calling their attention to the importance of developing the business of vegetable and fruit raising for the Northern market. The circular has been widely distributed, and assures the farmers that the road will furnish suitable cars, run quick trains and afford every facility possible. The company has a large cold storage house at Cincinnati in which perishable goods can be kept in case they find a dull market. Mr. Ryan goes fully into the details of the business, urging the importance of planting large areas of all kinds, in order that shippers may be prepared to do business at moderate rates of profit. The cities and other populous regions which farmers may expect to supply by shipping over this road are named, and hints as to the best method of packing, which kinds of vegetables to raise, etc., are very clearly given.

The foreign fruit business of this road is now heavy, being twice as large as last year at this time. The company has provided extensive wharves and warehouses at New Orleans, where steamships from the Mediterranean discharge directly into the cars.

### Anthracite Coal Tonnage.

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, has issued the following statement of anthracite coal tonnage for the month of December, 1888, and the year to Dec. 31, as compared with same period last year:

Month of December :		1888.	1887.	Inc. or De
Phila. & Reading.....	467,960	618,305	D.	150,345
Lehigh Valley.....	482,069	356,647	I.	125,422
Central of N. J.....	446,587	382,446	I.	64,141
Del., Lack. & W.....	532,437	725,685	D.	193,248
Del. & Hud. Canal Co.....	346,495	417,701	D.	71,206
Pennsylvania.....	267,081	351,213	D.	84,132
Pennsylvania Coal Co.....	72,835	151,734	D.	78,898
N. Y., L. E. & W.....	88,390	64,347	I.	24,043
Total.....	2,703,923	3,068,078	D.	364,155
From Wyoming Region.....	1,524,579	2,145,228	D.	620,649
"    Lehigh    ".....	519,175	36,511	I.	482,664
"    Schuylkill  ".....	600,170	886,340	D.	286,170
Year to Dec. 30:		1888.	1887.	Inc. or De
Phila. & Reading.....	7,175,095	7,555,252	D.	380,157
Lehigh Valley.....	6,592,716	5,794,451	I.	808,265
Central of N. J.....	5,742,279	4,852,859	I.	889,420
Del., Lack. & West.....	6,936,192	6,229,793	I.	706,399
Del. & Hud. Canal Co.....	4,486,188	4,048,230	I.	437,958
Pennsylvania.....	4,554,441	3,816,143	I.	738,297
Pennsylvania Coal Co.....	1,624,433	1,603,436	I.	20,997
N. Y., L. E. & W.....	974,374	759,834	I.	214,539
Total.....	38,145,718	34,641,018	I.	3,504,700
From Wyoming Region.....	21,852,365	19,684,929	I.	2,167,436
"    Lehigh    ".....	5,639,236	4,347,062	I.	1,292,174
"    Schuylkill  ".....	10,654,116	10,609,027	I.	45,089

The stock of coal on hand at tide-water shipping points



Dec. 31, 1888, was 652,156 tons; on Nov. 30, 1888, 569,233 tons; an increase of 82,923 tons. The amount on hand Dec. 31, 1887, was 130,977 tons. Of the total production in 1888, 57.29 per cent. was from the Wyoming Region, 14.78 per cent. from Lehigh Region, and 27.93 per cent. from Schuylkill Region. Eastern competitive tonnage, including all coal which for final consumption or in transit reaches any point on Hudson River or the Bay of New York, or which passes out of the Capes of the Delaware, 1888, 13,657,604 tons, and for 1887, 12,081,820 tons.

This statement includes the entire production of anthracite coal, heating purposes about the mines, and for steam and the entire anthracite coal tonnage actually transported by the respective roads, adjustment being necessary in the compilation to avoid duplications, etc.

#### Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending Jan. 12, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Jan. 12.....	238,828	106,036	344,864
Total for year 1889 to date.....	378,293	182,501	560,794
Total for year 1888 to date.....	425,470	188,077	613,547

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1888.	1888.	Dec.
For the week ending Jan. 12.....	26,806	38,208	9,312
For the year to that date.....	45,024	59,618	14,623

The Cumberland coal trade for the week ending Jan. 19 amounted to 56,549 tons and for the year to that date 162,050 tons.

#### Cotton.

The cotton movement for the week ending Jan. 18 is reported as follows, in bales:

	1888.	1887.	Inc. or Dec.	P. c.
Interior markets.....	94,383	44,170	I. 50,213	113.6
Receipts.....	122,888	57,540	I. 65,348	113.6
Shipments.....	407,063	423,832	D. 16,769	3.9

	1888.	1887.	Inc. or Dec.	P. c.
Receipts.....	149,178	105,403	I. 43,775	115.5
Exports.....	117,797	176,837	D. 59,040	33.4
Stock.....	917,387	974,334	D. 56,947	5.8

#### Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

##### NASHVILLE, CHATTANOOGA & ST. LOUIS.

	1888.	1887.	Inc. or Dec.	P. c.
Month of December.....	\$285,000	\$275,482	I. 9,518	3.4
Gross earnings.....	165,419	156,246	I. 9,173	5.8
Oper. expenses.....				

Net earnings..... \$119,676 \$119,236

Interest and taxes..... \$71,935 \$62,067

Improvements..... 3,845 13,448

Surplus..... \$75,780 \$75,515

Surplus..... \$43,896 \$43,721

Six months to Dec. 31:

Gross earnings..... \$1,635,264 \$1,601,638

Oper. expenses..... 952,938 822,447

Net earnings..... \$682,327 \$719,191

Interests and taxes..... \$436,508 \$370,918

Improvements..... 33,222 71,185

Surplus..... \$169,730 \$442,103

Surplus..... \$212,507 \$277,088

##### MILWAUKEE & NORTHERN.

Gross earnings..... \$1,085,650 \$702,000

Oper. expenses and rentals..... 746,000 633,000

Net earnings..... \$339,650 \$339,000

Fixed charges..... 222,420 209,540

Surplus..... \$119,230 \$129,460

##### OREGON IMPROVEMENT CO.

Month of November:

Gross earnings..... \$419,180 \$395,252 I. 23,928

Oper. expenses..... 328,876 289,876 I. 49,000

Net earnings..... \$90,304 \$105,376 D. 15,072

Year to Dec. 31:

Gross earnings..... \$1,442,671 \$1,358,815 I. 83,856

Oper. expenses..... 1,228,986 1,225,886 I. 3,000

Net earnings..... \$213,685 \$132,929 I. 80,756

##### LYKENS VALLEY.

Month of December:

Gross earnings..... \$82,731 \$92,207 D. 9,476

Oper. expenses..... 81,984 93,555 D. 11,571

Net earnings..... \$747 def. \$1,348 I. \$2,095

Year to Dec. 31:

Gross earnings..... \$1,012,212 \$911,066 I. \$101,146

Oper. expenses..... 1,027,232 1,012,308 I. 14,924

Deficit..... \$15,020 \$101,242 D. \$86,222

##### MEXICAN CENTRAL.

Month of November:

Gross earnings..... \$437,226 \$468,089 D. \$30,863

Oper. expenses..... 226,347 202,330 D. 24,017

Net earnings..... \$210,879 \$265,759 I. \$54,880

Month of December:

Gross earnings..... \$458,887 \$540,056 D. \$81,169

Oper. expenses..... 241,711 253,284 D. 11,573

Net earnings..... \$217,176 \$286,772 D. \$69,596

Month of November:

Chesapeake & Ohio..... 1888. \$337,073 \$403,365 I. 66,292 11.5

Net..... 118,089 D. 4,887 4.1

Cin., Ind., St. L. & C..... 211,399 220,182 D. 8,783 4.0

Net..... 76,086 D. 4,519 5.9

Denver, So. Pk. & P..... 75,740 96,372 D. 20,632 21.4

Net..... def. 31,040 def. 72 D. 30,698

Oregon Short Line..... 243,004 199,781 I. 43,223 21.6

Net..... 118,453 92,742 I. 25,711 24.5

Phila. & Reading..... 1,908,732 2,098,635 D. 189,903 9.9

Net..... 1,064,353 1,103,186 D. 38,833 3.5

P. & R. C. & I. Co..... 1,682,742 3,747,147 D. 2,064,405 123.3

Net..... def. 54,749 373,147 D. 318,398 58.2

Total both co's..... 3,591,494 4,320,891 D. 729,397 16.9

Net..... 1,009,604 1,476,333 D. 466,729 46.3

Southern Pacific Co..... 2,990,127 2,600,969 I. 389,158 8.9

Net..... 1,065,262 1,117,794 I. 52,532 4.9

Total of all..... 1,170,715 3,735,224 I. 435,491 11.7

Net..... 1,496,349 1,514,431 D. 18,082 1.2

	1888.	1887.	Inc. or Dec.	P. c.
Month of December:				
Baltimore & Ohio.....	1,317,100	1,248,633	I. 68,467	5.5
Lines E. of Ohio R.....	408,662	349,778	I. 58,884	16.8
Net.....	424,932	420,618	I. 4,314	1.0
Lines W. of Ohio R.....	88,932	55,516	I. 33,416	60.2
Net.....	1,742,032	1,669,251	I. 72,781	4.4
Total all lines.....	889,276	850,345	I. 38,931	4.6
Cleveland & Canton.....	32,201	28,804	I. 3,397	11.8
Net.....	9,342	7,011	I. 2,331	33.3
Mar., Col. & No.....	8,624	6,773	I. 1,851	27.5
Net.....	3,718	2,729	I. 989	36.6
Nash., Chat. & St. L.....	285,125	275,482	I. 9,643	3.5
Net.....	119,676	119,236	I. 440	0.4
Prest. & Ariz. Cen.....	11,714	8,639	I. 3,075	35.8
Net.....	8,635	5,687	I. 2,948	51.7
San A. & Aran. Pass.....	97,124	60,041	I. 37,083	61.8
Net.....	39,104	21,975	I. 17,129	78.4

#### Eleven months—Jan. 1 to Nov. 30:

	1888.	1887.	Inc. or Dec.	P. c.
Cin., I., St. L. & C.....	2,430,508	2,455,187	D. 24,679	1.0
Den., So. Pk. & Pac.....	1,192,467	1,089,345	I. 103,122	9.4
Net.....	def. 80,686	106,582	D. 187,278	16.6
Oregon Short Line.....	2,466,615	1,846,257	I. 620,358	33.6
Net.....	1,117,271	658,751	I. 458,520	69.4
Phila. & Reading.....	19,099,680	20,187,417	D. 1,087,737	5.4
Net.....	9,066,404	10,517,279	D. 1,450,875	13.5
P. & R. C. & I. Co.....	17,250,231	18,083,282	D. 833,051	4.6
Net.....	74,853	1,470,132	D. 1,395,279	94.9
Total both co's.....	36,349,691	38,270,690	D. 1,920,999	5.0
Net.....	9,171,257	11,987,409	D. 2,816,152	23.5

#### Southern Pacific Co.:

	1888.	1887.	Inc. or Dec.	P. c.
Pacific System.....	32,291,303	25,975,049	I. 6,316,254	24.3
Net.....	11,726,739	11,650,423	I. 76,316	0.7
Total of all.....	42,721,921	35,110,338	I. 7,611,583	21.6
Net.....	14,802,087	14,226,468	I. 575,619	4.4

#### Twelve months—Jan. 1 to Dec. 31:

	1888.	1887.	Inc. or Dec.	P. c.
Clev. & Canton.....	379,183	373,413	I. 5,770	1.5
Net.....	118,442	108,142	I. 10,300	9.6
Marietta, Col. & N.....	88,289	69,804	I. 18,485	26.4
Net.....	38,351	31,736	I. 6,615	9.3
Nash., Chat. & St. L.....	3,125,280	3,055,917	I. 69,363	2.3
Net.....	1,284,539	1,361,214	D. 76,675	5.8
Prescott & Ariz. Cen.....	125,727	91,391	I. 34,336	37.6
Net.....	77,025	55,965	I. 21,060	37.4
San A. & Aran. Pass.....	1,001,230	560,334	I. 440,896	78.8
Net.....	334,501	210,661	I. 123,840	59.9

#### Month of December:

Atlantic & Pacific.....	\$323,449	\$240,308	I.	\$83,141	34.6
Buff., Roch. & Pitts.....	170,777	198,292	D.	27,515	13.9
Bur., Col. Rap. & N.....	303,897	305,375	D.	1,478	0.5
Cairo, Vin. & Chic.....	62,636	64,632	D.	1,996	3.1
Canadian Pacific.....	1,147,000	1,151,741	D.	4,741	0.4
Cape Fear & Yad. Val.....	28,956	28,837	I.	1,219	9.1
Central of Iowa.....	123,658	134,512	D.	10,854	8.8
Chesapeake & Ohio.....	250,740	249,624	I.	1,116	0.4
Ches., Ohio & So. W.....	181,884	203,068	D.	21,184	10.4
Chicago & Atlantic.....	190,948	197,607	D.	6,659	3.4
Chi. & East. Ill.....	187,903	184,129	I.	3,774	2.0
Chi. & Ind. Coal.....	53,750	49,880	I.	3,870	7.7
Chi., Mil. & St. Paul.....	2,273,709	2,517,709	D.	244,000	9.7
Chicago & Ohio R.....	7,703	7,138	I.	565	7.9
Chi., St. P. & K. C.....	220,250	178,753	I.	41,497	23.2
Chi. & W. Mich.....	101,212	96,914	I.	4,298	4.4
Cin., Jack. & Mack.....	44,631	37,617	I.	7,014	18.6
Cin., N. O. & Tex. P.....	319,497	298,097	I.	21,400	7.2
Ala. Gt. South.....	158,420	158,425	D.	5	0.0
N. O. & Northeast.....	111,517	85,636	I.	25,881	30.3
Vicks. & Meridian.....	73,334	64,341	I.	8,993	14.3
Vick., Shreve & P.....	71,358	71,558	D.	2,423	5.9
Cin., Rich. & Ft. W.....	32,346	34,853	D.	2,507	7.2
Cin., Wash. & Balt.....	182,064	213,733	D.	31,669	14.8
Cleve., Akron & Col.....	35,926	30,986	I.	4,940	15.9
Cleveland & Canton.....	32,000	28,804	I.	3,196	11.1
Cleve., Col. & In.....	644,809	745,509	D.	100,700	13.5
Cleve. & Marietta.....	15,619	19,244	D.	3,625	18.8
Col. & Cin. Midland.....	38,802	37,542	I.	1,260	3.4
Col. Hock. V. & Tol.....	221,267	234,796	D.	13,529	5.7
Denver & Rio Grande.....	610,300	714,134	D.	103,834	14.5
Den. & Rio G. W.....	120,000	94,425	I.	25,575	27.1
Det., Lansing & No.....	79,938	81,137	D.	1,199	1.5
East Tenn., Va. & G.....	489,244	503,288	D.	14,044	2.8
Evansville & Ind.....	23,003	19,204	I.	3,799	19.8
Evans & T. Haute.....	65,811	71,152	D.	5,341	7.5
Flint & Pere Mar.....	292,765	298,087	D.	5,322	2.5
Flt. W. & Den. City.....	101,032	74,893	I.	26,139	35.3
Gr. Rapids & Ind.....	166,333	176,911	D.	10,578	6.0
Other lines.....	16,340	13,885	I.	2,455	17.7
Grand Trunk of Can.....	1,422,452	1,455,165	D.	32,713	2.2
Humeston & Shen.....	15,000	17,420	D.	2,420	14.0
Ind., Dec. & Western.....	43,424	32,391	I.	11,033	34.0
Kanawha & Ohio.....	21,030	24,270	D.	3,240	10.6
*Kan. C., Ft. S. & M.....	22,827	22,827	D.	18,456	7.0
*Kan. C., Clin. & Sp.....	14,039	14,039	D.	1,379	9.8
Kentucky Central.....	89,967	81,137	I.	8,830	10.9
Keokuk & Western.....	20,908	21,175	D.	267	1.3
Kings & Pembroke.....	8,830	8,830	D.	1,247	17.7
Lake Erie & Western.....	192,771	161,879	I.	30,892	19.1
Lehigh & Hudson.....	21,067	15,293	I.	5,774	37.7
*Little Rock & Mem.....	49,323	63,477	D.	14,154	22.3
Long Island.....	216,205	211,212	I.	4,993	2.4
Louis. Evan. & St. L.....	75,914	100,298	D.	24,384	24.3
Louis. & Nashville.....	1,140,265	1,140,265	D.	0	0.0
Louis., N. Alb. & C.....	172,648	167,597	I.	5,051	3.0
Louis., N. O. & Tex.....	314,467	300,405	I.	14,062	4.7
Mar., Col. & North.....	8,624	6,773	I.	1,851	27.2